THE FOUNDRY

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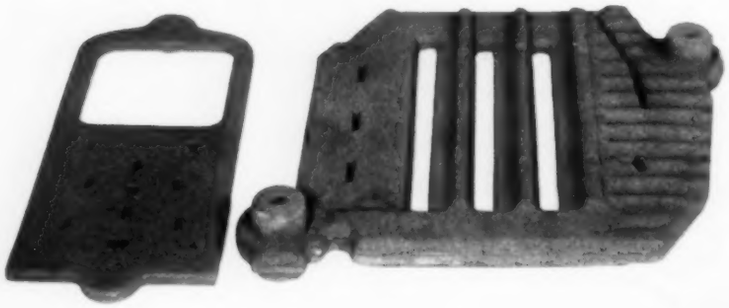
LINOIL

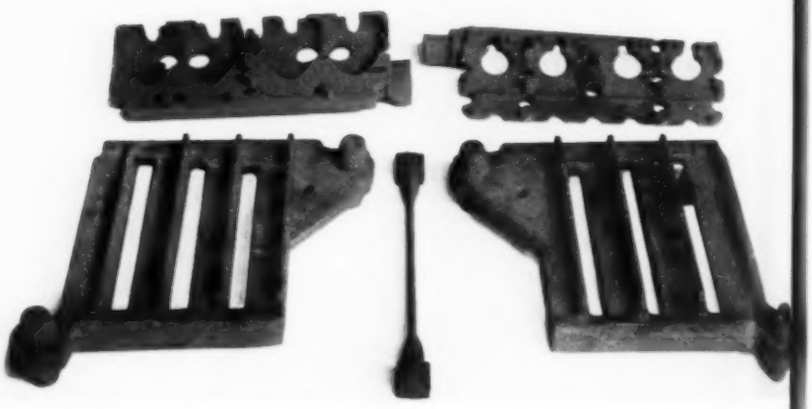
LET'S GO! AMERICA

KEEP 'EM FLYING
through the foundry
with LINOIL
for DEFENSE
and for profit

Vast tonnage of the American foundries rolls out for defense. Much of it is made with Linoil cores. Boiler section cores shown here are part of the defense program.



All over the country Linoil is used in such quantities as never before. The qualities that make Linoil good business in slower days make it indispensable now. Now as never before is the long range uniformity of Linoil appreciated—the 25-year record for uniformity gives the foundryman something solid to lean upon — lean upon and safely forget — while he concentrates on priorities, scrap, pig, labor, taxes, reports, et cetera. And if you are interested in economy, check Linoil at the mixer, core bench, ovens, mold setup, cleaning room, inspection. Take the cost savings, the top speed production, and the assurance of uninterrupted production that Linoil offers—today.



THE FOUNDRY

EDITORIAL

Should Recognize Foundry Industry As Basic

IF, FOR some reason, the production of castings in this country suddenly should cease, what would happen to the defense program of the United States?

Strange as it may seem to some, the entire effort toward the defense of this country and the preservation of world democracies would stop almost immediately.

We would not be able to produce airplanes, tanks, ships, cranes, machine tools, various types of guns and shell, locomotives, railway cars, and a large percentage of the items to be found on the critical list of the Army and Navy Munitions Board. If it were not for castings, steel mills could not operate, new capacity in the field of metals would be impossible, plastics could not be produced, and the problem of feeding this nation and perhaps, at some later date, the entire world, could not be solved.

Castings are indispensable to the maintenance of our highly industrialized civilization and the protection of our national existence.

Then why does official Washington fail to recognize the importance of the product of the foundry industry in the success of the war effort? Why does official Washington, without the guidance and counsel of foundrymen, continue to establish rules under which the foundry industry must operate, when some of these hinder rather than help the defense program?

The answer to these questions are fairly simple. Foundrymen have been so engaged with their own immediate problems—making castings for defense and at the same time continuing the march of progress in both practice and product—that they have failed to recognize the tremendous importance of gaining proper recognition for the industry among the different government agencies handling the various phases of the war effort. Undemocratic as it may be, official Washington still pays the greatest amount of attention to the groups exerting the greatest pressure. To date the foundry industry has been quiet to a fault.

If the war effort of this country is to be provided with the best that this industry is capable of producing, and if the ever increasing demands for castings are to be met, the Office of Production Management should recognize the important fact that the foundry industry is basic and not an adjunct to any other industrial group serving in this emergency. As an industry it should be accorded a separate Foundry Defense Advisory Committee, covering all branches of the industry. Under this overall advisory committee, the OPM should set up five official advisory subcommittees to deal with the problems of the following branches: Steel Castings; Malleable Iron Castings; Gray Iron Castings; Brass and Bronze Castings; and Aluminum and Magnesium Castings. Nothing in this suggestion will prevent the various subcommittees from functioning with the proper commodity divisions of the OPM, the three ferrous subcommittees with the iron and steel division and the two nonferrous subcommittees with the corresponding nonferrous commodity groups. As this is written, a steel castings subcommittee had been set up under the iron and steel division, but no attempt seems to have been made to correlate the problems of the various branches of the foundry industry.

In addition to the committee organization, the staff of OPM should be augmented with men to serve as contact with the foundry industry and the several defense agencies. Each of these men should be a recognized expert in one of the previously mentioned five branches with a background covering both administrative and technical duties. These men could assist in the preparation of *necessary* orders affecting the production of castings, prevent the issuance of those not necessary in furthering the defense effort, serve as an interpreter of the various orders, prevent expansion of facilities where present capacity is sufficient to meet defense demands but assist in building plants where proper surveys indicate the need.

The impetus for such a set up must be supplied by the foundry industry.

Frank G. Steinebach

Editor

By Edwin Bremer

Cast Steel Mortar Shells

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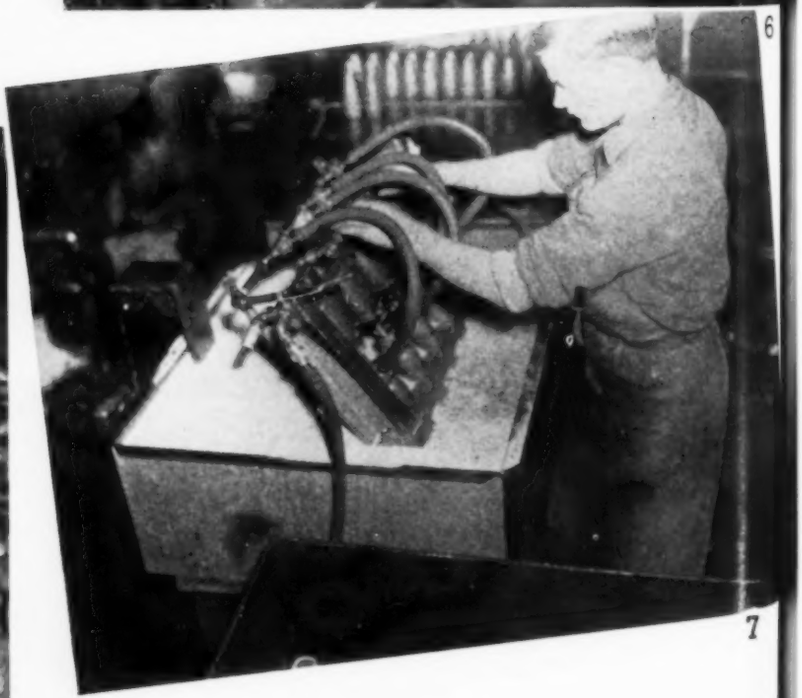

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Fig. 1—Grinding off gates, etc. Fig. 2—Removing blown cores from boxes. Fig. 3—Clipping tail end for length. Fig. 4—Waiting for firing signal. NEA photo. Fig. 5—Final inspection for wall thickness. Fig. 6—Hydrostatic testing at 1000 pounds per square inch. Fig. 7—Porosity testing on final inspection. Fig. 8—Pouring a test piece for the laboratory. Fig. 9—At left is 3-inch British shell weighing approximately 7 pounds while the 60 millimeter American shell weighing nearly 2 pounds is at right

IN MODERN warfare, as well as in the past, the mortar satisfies an important requirement that cannot be met easily by other more powerful pieces of ordnance. Its comparatively short range and low muzzle velocity make the mortar seem almost puny beside a cannon of equal caliber, but its high angle of fire, from 40 to 60 degrees, far outweighs those disadvantages. This angle of fire permits the mortar shell after firing to drop almost straight down, a feat impossible for more powerful weapons with longer and flatter trajectories.

Shell Fragmentation Is Important

Naturally, the mortar is effective only in comparatively close range combat, and serves efficiently in cleaning out the enemy in opposing trenches, shell craters, machine gun nests and other excavations where the combatants' bodies, hidden below the general terrain level, are not exposed to comparatively straight, direct fire. The mortar, with its almost vertical fire, can drop its death dealing shell in the midst of such excavations, and for that reason is regarded highly by military men.

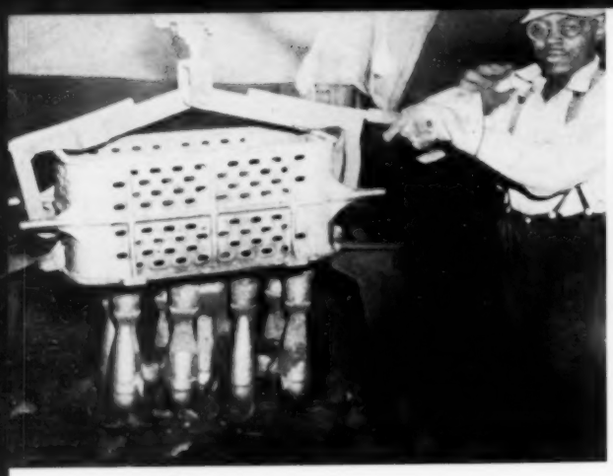
The mortar shell is as important as the mortar since the shell is essentially the instrument of destruction. One of the prime requisites of a mortar shell is its ability to break into small pieces on explosion after it reaches its objective. That ability to break, or fragmentation as it is termed in military circles, must be such that it will create the greatest possible damage to those within its range. Hence, the pieces or fragments caused by bursting of the shell must not be too large on one hand, or too small on the other, since considerably greater havoc can be raised in a group of men by a large quantity of small missiles, say ⅛-inch in diameter, than by a few large ones of 2-inch diameter.

Due to the accuracy required in fragmentation characteristics, in wall thickness, weight, etc., mortar shells necessitate close attention to details and careful control in production. The overwhelming demands of the national defense programs and lend-lease programs called for additional production facilities, and attention logically was directed to the steel foundry field as a possible source for mortar shells. One of the first steel foundries to co-operate with the Army Ordnance in solving the problem of providing suitable mortar shells was the Auto Specialties Mfg. Co., St. Joseph, Mich. After considerable painstaking investigation a steel composition was developed, which with a short heat treatment, met the desired fragmentation requirements. Rapid production methods were set up to fulfill demands as to uniform wall thickness, smoothness of surface, weight limitations, etc.

Makes Shells in Two Sizes

At the present time the firm not only produces 60 millimeter mortar shells for the Army, but also a somewhat larger, 3-inch mortar shell for Great Britain. The 60 millimeter shell is made of low carbon cast steel which receives a 15-hour heat treatment while the British shell is made from a medium carbon steel which receives a 9-hour heat treatment. Since production of both types of shell differs only in slight detail it will be convenient to describe the manufacture as a single phase mentioning the variances as they occur.

Steel for the shells is melted in electric fur-



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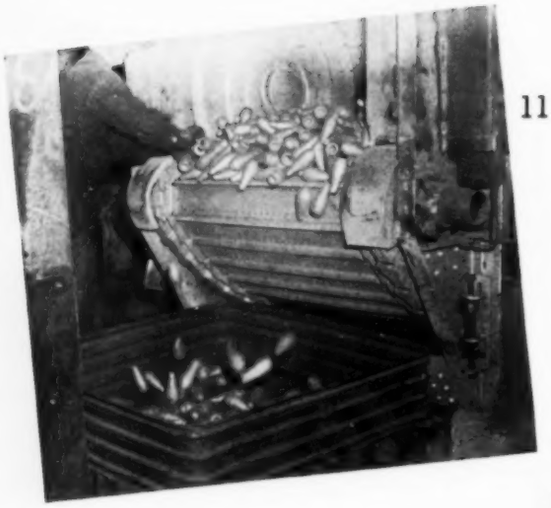

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naces, and the Auto Specialties Mfg. Co. is one of the two steel foundries using a continuous melting process. Raw material is comprised of 30 to 40 per cent return sprue and gates, and 60 to 70 per cent low carbon plate scrap with a small amount of ore. The heats melt down with 0.16 to 0.18 per cent carbon and extremely low silicon and are brought to the proper analysis; carbon being picked up from ferromanganese or by additions of pig iron. The steel is melted in four electric furnaces. One has a capacity of 40-tons of hot metal, another a capacity of 9 tons, and the remaining two have capacities of 8 tons. First two furnaces were supplied by the Pittsburgh Lectromelt Furnace Co., Pittsburgh, and the other two are reconstructed Ludlum type furnaces.

Previously it was mentioned that the steel is

Fig. 10—Molds after cooling are dumped on vibrating shakeout screen. Fig. 11—Shot blasting shell exterior. Fig. 12—Shell ready to be placed in mortar. U. S. Signal Corps photo. Fig. 13—Setting cores in shell mold. Fig. 14—Constant composition control maintained by laboratory

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Fig. 15—Removing castings and feeders from gates and sprues. Fig. 16—Pouring shell molds. Fig. 17—Tensile test determination. Fig. 18—Cutting off feeders with abrasive wheel. Fig. 19—Centering cores in mold with a gage. Fig. 20—Abrasive cleaning of shell interior. Fig. 21—Making the cope

melted and poured continuously during the two-shift or 16-hour day. The procedure is to charge all four furnaces with cold metal early in the morning at the end of the second shift. Melting and charging schedule is arranged so that the different furnace heats are staggered about 1 hour apart. Melting begins about 3:30 a. m. and pouring at 7:30 a. m. from the first of the small furnaces ready. The large furnace with its greater tonnage requires a somewhat longer melting period, but is ready just about the time the first small furnace has been emptied.

Approximately 40 to 60 minutes are required to pour off the heat from one of the small furnaces. Steel from the small furnaces is taken off in 350-pound ladles and poured directly into the moving molds on a conveyor close to the furnaces. When one of the small furnaces is emptied, steel is taken from the large 40-ton furnace

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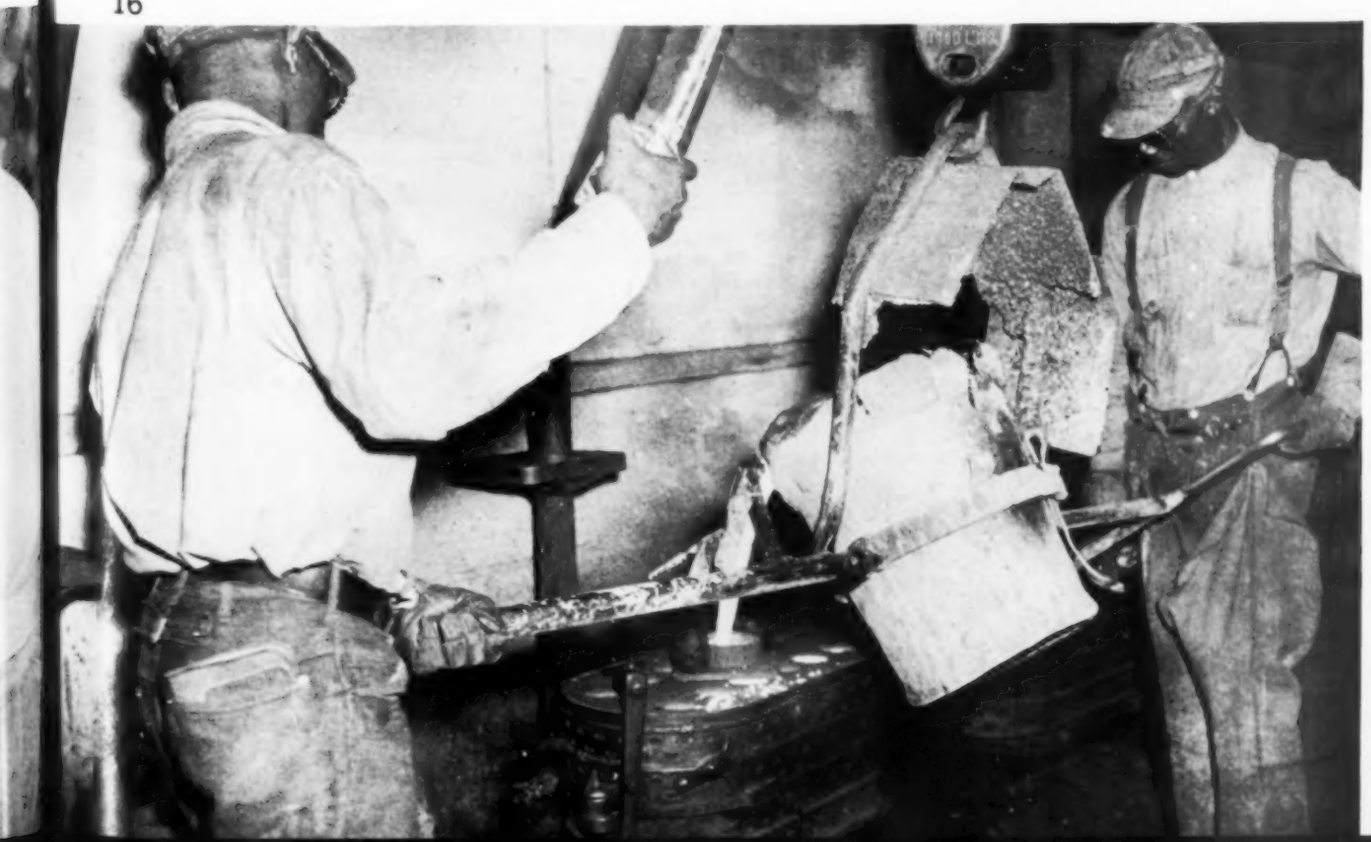

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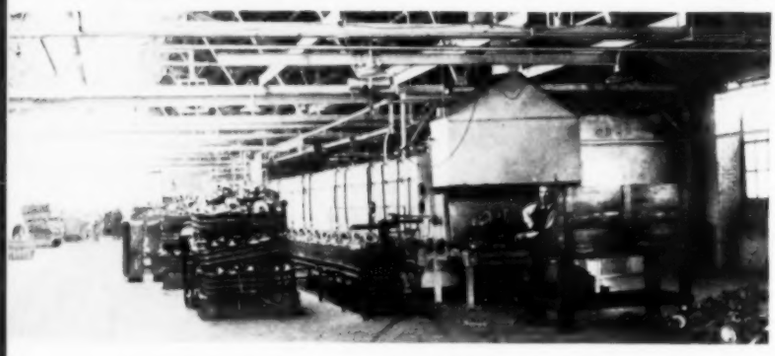

in a 4-ton ladle and transferred to it. After a sufficient time to permit the metal being brought up to temperature and adjustment of composition, the small heat is ready for pouring into the waiting molds.

Before pouring is begun from the small furnaces nearly all slag covering the bath is removed leaving a nearly bare metal surface. Approximately half through the heat the slag again is skimmed off. Optical pyrometer is used for determination of temperatures on tapping from the furnaces which shows about 3000 degrees Fahr., and on pouring which ranges from 2850 to 2900 degrees Fahr. As each small furnace is emptied it is charged with hot metal from the 40-ton furnace so that at approximately 10:30 a. m. 25 tons of metal have been removed from the latter. Then sufficient cold material, about 10 tons, is added to provide enough metal for filling the three small furnaces again, and the power turned on to insure completion of melting at 2 p. m. when they will be ready for hot metal charges. Around 3 p. m. the 40-ton furnace has delivered practically all its metal to the small

25

Fig. 22—Determining temperature with optical pyrometer. Fig. 23—Clipping feeders from casting. Fig. 24—Heat treating furnace. Fig. 25—Marking lot number on shell. Fig. 26—Applying core coating and drying in tunnel oven. Fig. 27—Metallurgical microscope enables close study of structure

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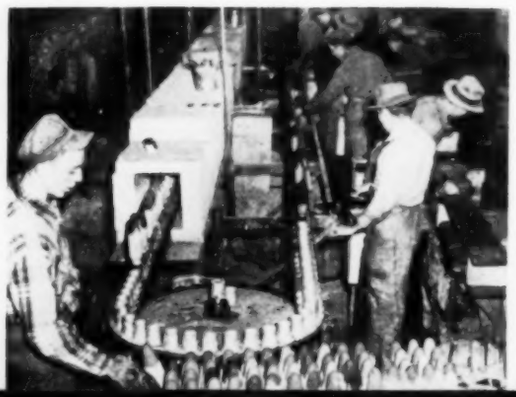

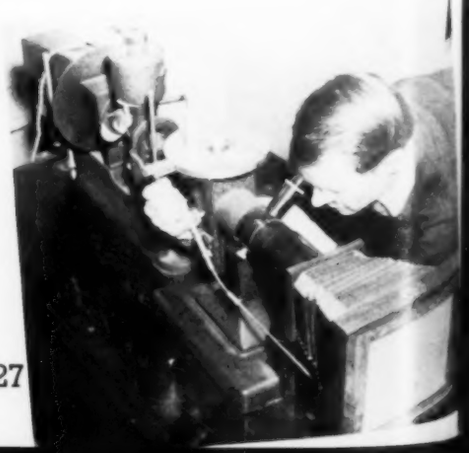

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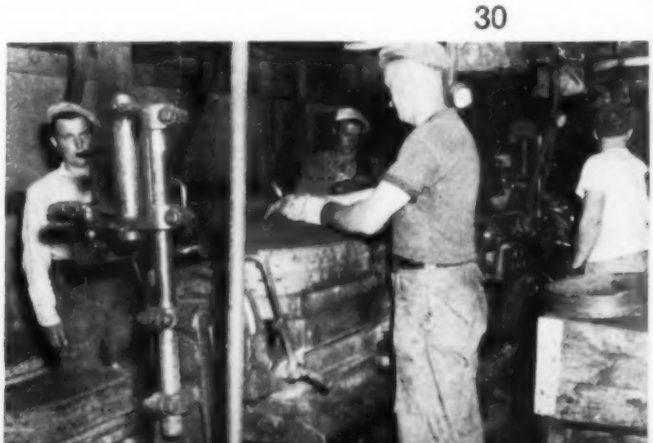
furnaces, and then is charged completely with cold metal. Full power is turned on so that the molten steel will be available at 9 or 10 p. m. At the end of the second shift all furnaces are empty, and are charged with cold metal in preparation for the first shift operations on the following day.

Quality of the steel is under careful control at all times. From one to three preliminary carbons are run on the heats and of those at least one determination is made by the laboratory, and the others by an electrical device called a Carbanalyzer made by the Fisher Scientific Co., Pittsburgh, which is located on the furnace floor. Following the preliminary determinations, the carbon content is adjusted if necessary, and then ferromanganese and ferrosilicon are added. Test samples are taken after pouring is begun, on the second ladle, the fifteenth, the thirtieth, and last ladles. Those are taken to the laboratory as made, for determination of carbon, silicon and manganese contents, and the figures reported to the furnace melters by telephone. Once each day on each furnace (*Please turn to page* 124)

Fig. 28—Transferring metal to smaller furnace. Fig. 29—Making the drag. Fig. 30—Preparing drag for placement on conveyor. Fig. 31—Mortar crew in position to shell hilly terrain. NEA photo. Fig. 32—Cores for American shells made by hand. Fig. 33—Carboanalyzer used on furnace floor



War Materiel Exhibit To Feature A.F.A. Show in Cleveland

TO FURTHER the National Defense Program and to show the participation of the foundry industry in that program the forty-sixth annual convention and exhibit of the American Foundrymen's Association to be held at Cleveland will feature a comprehensive display of war materiel and educational information from the Army Ordnance and other government departments. Approximately 50,000 square feet of space will be devoted to the exhibit which is being sponsored by the Cleveland Post, Army Ordnance Association in cooperation with C. E. Hoyt, manager of exhibits, and a special committee which will provide all types of castings employed in national defense.

Convention will be held on April 18 to 24 with the Northeastern Ohio Chapter acting as host to the thousands of foundrymen from all over the country who will attend. Plans for the entertainment of out-of-town foundrymen are being arranged by committees appointed by Frank J. Dost, Sterling Foundry Co., Wellington, O., and president of the Northeastern Ohio Chapter.

Will Surpass Former Shows

Previous conventions have been held in Cleveland in 1906, 1916, 1923, 1930 and 1938, but there is no doubt that the forthcoming 1942 convention will surpass those of the past. Plans now being arranged for the Foundry and Allied Industries show to be held in the Cleveland Public Auditorium and Exhibition hall indicate that it will be the most extensive and spectacular ever presented.

Unusual opportunity will be offered to further the National Defense program through displays of new equipment and materials. In addition the various sessions will provide a medium for interchange of ideas on methods of production which is unexcelled. Cleveland's central location necessitating only an overnight journey from the East and Middlewest, and its ample facilities for meeting rooms, exhibition hall and hotel accommodations closely adjacent to each other, give promise of an outstanding exhibition and convention.

The Foundry and Allied Industries show will open on Saturday, April 18 for a preview by foundrymen in Northeastern Ohio. That practice, as indicated by the past two foundry exhibitions, will bring many thousands to inspect the various displays of equipment and supplies. The convention program of technical sessions will begin on the following Monday afternoon—the exhibition continuing throughout the week.

Extensive Program Scheduled

Program for the technical meetings, already well along, will present a complete schedule of meetings on research, management and shop practices as affecting steel, malleable, non-ferrous and gray iron casting production. Many phases of defense problems affecting casting production will be covered. Foreman and apprentice training, cost methods, job evaluation and time study, sand research, plant and plant equipment, patternmaking and safety and hygiene will be discussed by speakers before the general interest sessions. The annual lecture course will be a completion of the lectures of the 1941 convention on core practices and theories. Shop practice courses on gray iron founding and sand control are also scheduled.

Arrangement of the technical meetings will be under the direction of the A.F.A. Board's Technical Activities Correlation Committee, composed of the chairman, F. J. Walls, International Nickel Co., Detroit; H. Bornstein, Deere & Co., Moline, Ill.; R. J. Allen, Worthington Pump & Machinery Corp., Harrison, N. J.; D. P. Forbes, Gunite Foundries Corp., Rockford, Ill.; W. J. Corbett, Atlas Steel Casting Co., Buffalo, N. Y.

Program arrangements for the various sessions are being developed by the following com-

Photos courtesy U. S. Army Signal Corps and Cleveland Convention Bureau

mittees which are in charge of various activities:

Foundry Cost Methods—Chairman, R. L. Lee, Liberty Foundry Div., Grede Foundries, Inc., Wauwatosa, Wis.

Apprentice Training—Chairman, C. J. Freund, University of Detroit, Detroit, Mich.

Foreman Training—Chairman, W. E. George, Campbell Wyant & Cannon Foundry Co., Muskegon, Mich.

Job Evaluation and Time Study—Chairman, F. E. Wartgow, American Steel Foundries, East Chicago, Ind.

Plant and Plant Equipment—Chairman, James Thomson, Continental Roll & Steel Foundry Co., East Chicago, Ind.

Refractories—Chairman, J. A. Bowers, American Cast Iron Pipe Co., Birmingham, Ala.

Sand Shop Operation Course—Chairman, E. E. Woodliff, Harry W. Dietert Co., Detroit, Mich.

Gray Iron Shop Operation Course—Chairman, K. H. Priestly, Eaton-Erb Foundry Div., Eaton Mfg. Co., Vassar, Mich.

Foundry Sand Research—Chairman to be appointed.

Safety and Hygiene—Chairman, James R. Allan, International Harvester Co., Chicago.

Gray Iron Castings—Chairman, F. J. Walls, (*Please turn to page* 149)

Melting

2

Quality Iron in the Cupola

By Harold S. Austin

Buick Motor Division
Flint, Mich.

THERE are many modifications in the design of cupolas. Those at Buick may be called the standard type; in other words, about the same as found in most foundries.

There is a battery of six cupolas with 96-inch shells. They are 67 feet high from the bottom ring to the top of the stack. The refractory lining above the tuyeres to the charging doors consists of one layer of fire brick, laid flat—2½ inches thick and one layer of cupola block—6 inches thick, plus ½ inch of fireclay next to the shell to allow for expansion, making a total thickness at this point of 9 inches. Above the charging doors the lining consists of one layer of cupola block only. The well is lined in the same manner as the lining above the tuyeres. Directly above the tuyeres the lining is boshed out about 4 inches and extends upward for about 3 feet, merging into the walls at this height.

The tuyeres are continuous; the upper plates are hung through slotted holes to bolts fastened to the shell and may be quickly removed and replaced. The opening in the tuyeres is 8 inches high and the ratio of tuyere area to cupola working area is approximately 25 per cent. The bottom of the tuyeres are 31 inches above the cupola ring. No upper tuyeres are used.

For a tap hole two cupola blocks of special design known as "A" and "B" blocks as used. These are shown in Fig. 4. The "B" block is placed on the inner side of the breast and the "A" block on the outside. The "B" block lasts about six heats and the "A" block is replaced daily. The diameter of the tap hole is 1¾ inches, and with the air pressure used will fill an 1800-pound ladle in from 30 to 40 seconds. Trouble caused by these blocks is rare.

Slagging is at the rear of the cupola and for the slag hole a specially designed block of silicon carbide is used. This block is 4¾ inches wide, 6 inches high, (*Please turn to page* 139)

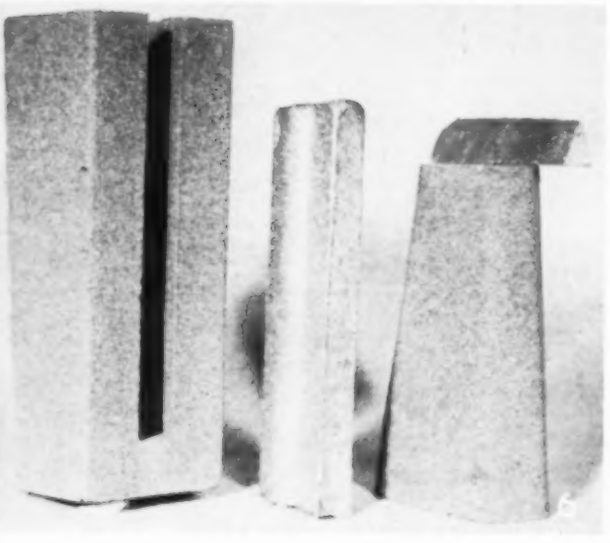
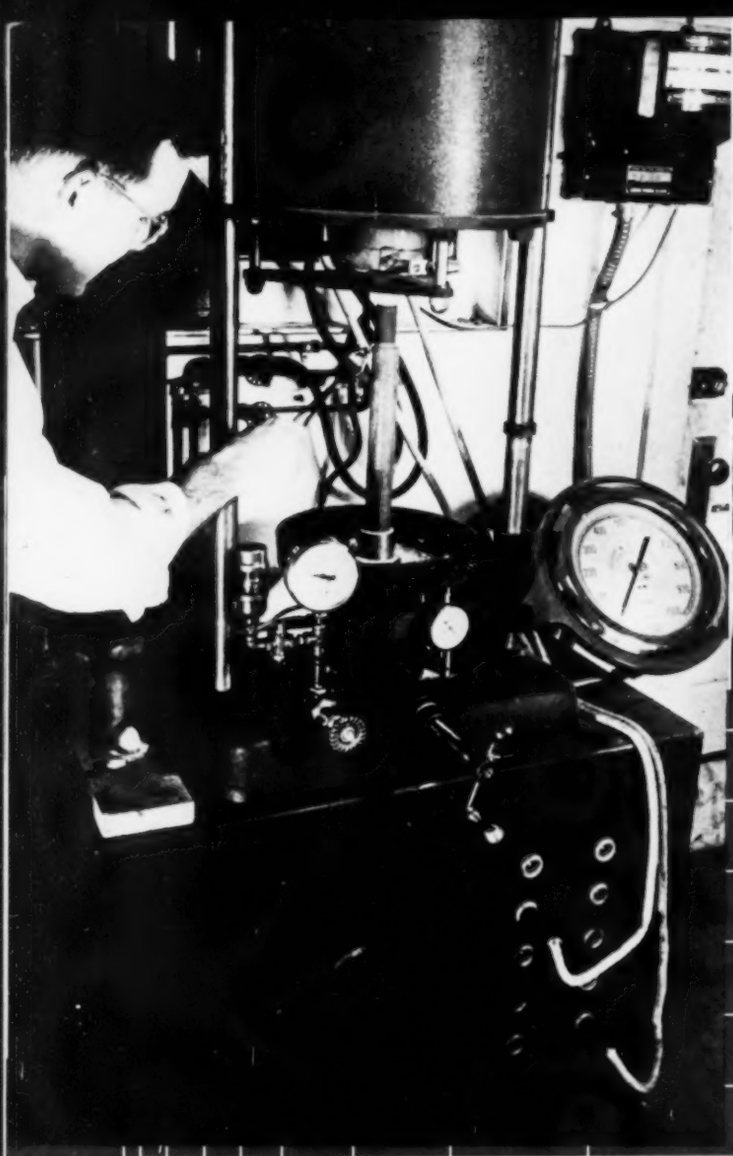
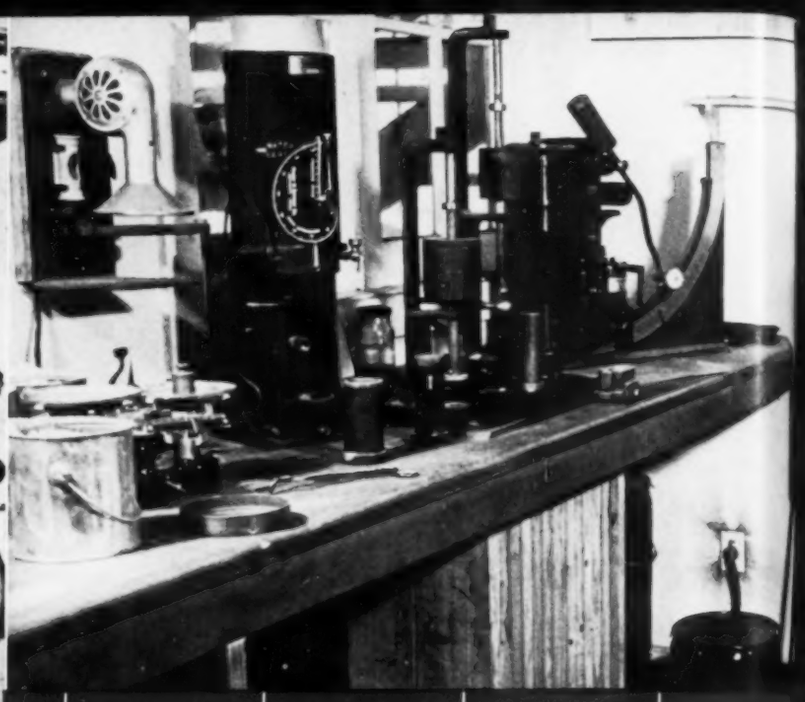
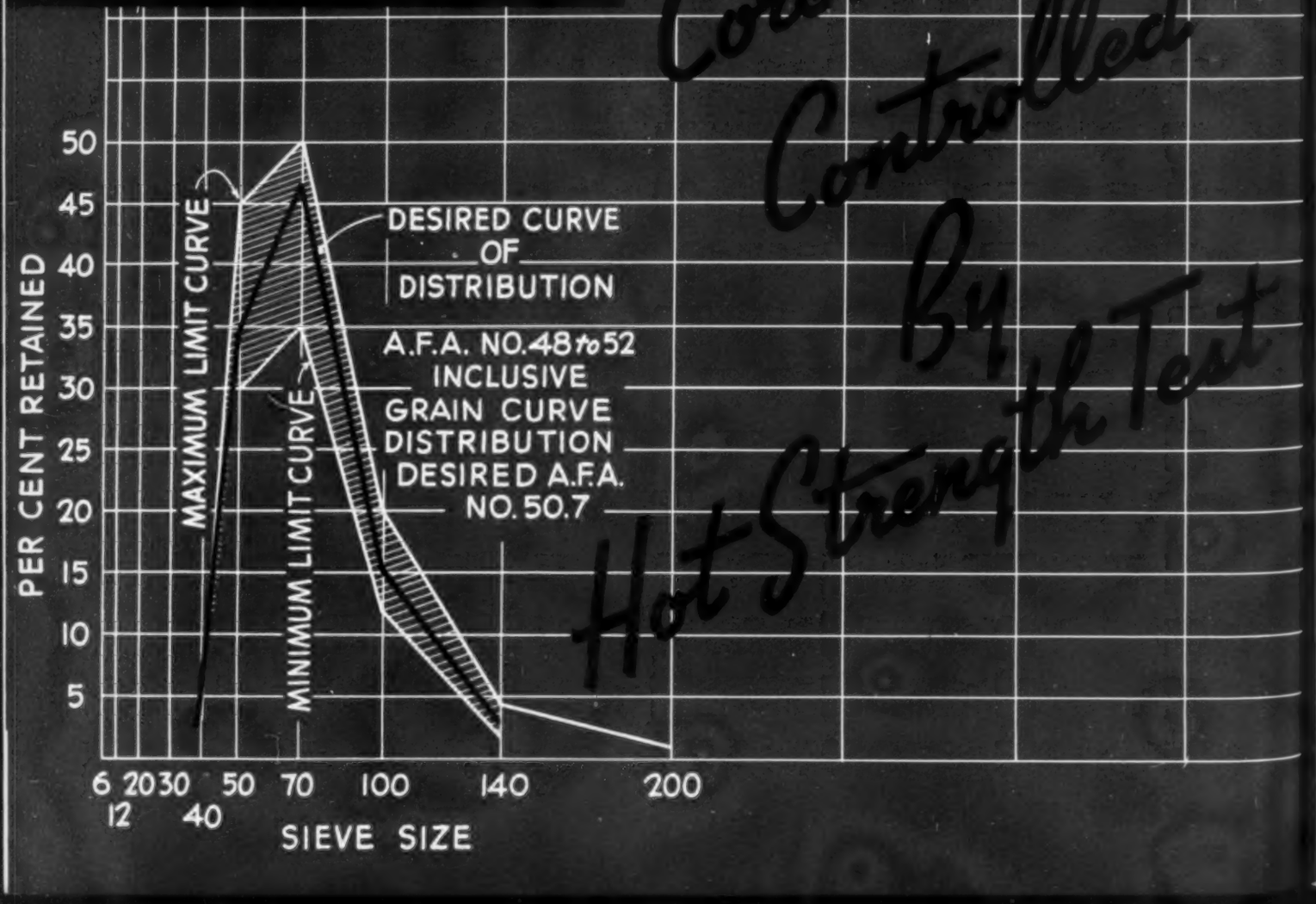


Fig. 1—Close-up view of tapping into the ladle. Fig. 2—Ladles suspended from overhead trolleys transfer iron from cupola to the molds. Fig. 3—Magnet used in charging bucket. Fig. 4—Fractured chill and wedge bars used in cupola control. Fig. 5—Two types of cupola tapping blocks are used. Fig. 6—Chill and wedge bars are made in cores. One face of chill bar at the left is cast against a chill





Core Mixtures Controlled By Hot Strength Test



By FRED B. RIGGAN
Metallurgist
Key Co., East St. Louis, Ill.

A VERY satisfactory oil sand core procedure for steel castings had been in operation at our plant until production was stepped up out of proportion to the core baking facilities. In fact the discovery of just how much time was necessary for baking an oil sand core, particularly those having appreciable amounts of silica flour was a revelation. It was found that our larger cores, although hard to the center, were not properly baked all the way through.

Placed Test Core in Center

A wood pattern, the same shape but slightly larger than a tensile test core, was used to form an impression at the center of cores four inches in diameter or larger. The test core was placed carefully into the impression and the half core with the test core in place was then turned out of the core box onto the core drying plate. After baking, the tensile cores would have satisfactory hardness and strength if they were removed from the large core while hot and cooled in air, but if allowed to remain in the large core and cool while protected from the air, they would not show satisfactory hardness and strength. This indicated that the large oil core was not baking to the center even though the outside surface might give the impression of a well baked core.

The use of crude sand for cores was discontinued due to the difficulty of buying on sufficiently uniform A. F. A. grain size and grain distribution tolerances. It was not economical to buy crude sand or set up to dry it ourselves. As a consequence we would get an extreme variation in moisture content of the new sand as it arrived at the plant. Another bad feature in the use of crude sand was that it would freeze in the winter and could not be moved into the hoppers without great difficulty.

A sand specification covering both A. F. A. grain size and distribution limits was accepted by certain of the producers and is in operation at this time. A variation of A. F. A. grain size of from 48 to 52 can cause a variation in permeability of our sand of 30 per cent if no regard is given to the distribution curve. Data on the specification are presented in Fig. 2 and Table III.

The cores were baked in an elevator type continuous oven at 515 degrees Fahr. with an overall 2½ hour cycle. This was not a satisfactory procedure for several reasons: (1) The cores did not seem to do much better the second trip around the oven than they did the first trip. Tensile cores added into the center of larger cores would take a ridiculously long time to bake. Those with appreciable amounts of silica flour would not bake to the (*Please turn to page* 151)

Fig. 1 (Upper left)—High temperature sand dilatometer. Fig. 2 (Lower left)—Grain distribution curve employed for sand specifications. Fig. 3 (Above)—Partial view of the sand testing laboratory and equipment

Table I

Physical Properties of Mixtures

No.	Green Perm.	Dry Perm.	Green Comp. lb.	Defor-mation 0.001-in.	Moisture Per Cent	Tensile lb. sq. in.	Hard-ness	Hot Str. at 2500°F. lb.
1.....	150	210	2.5	30	3.0	90	60	4
2.....	120	160	2.2	28	4.0	100	66	22
3.....	135	200	2.0	40	3.3	98	64	12

Table II

Oxide Additions Increase Strength

Oxide	Green Perm.	Dry Perm.	Green Comp. lb.	Defor-mation 0.001-in.	Moisture Per Cent	Tensile lb. sq. in.	Hard-ness	Hot Str. at 2500°F. lb.
None	150	220	2.3	29	2.8	105	65	3
	150	220	2.5	23	2.9	100	60	3
	150	230	2.1	32	3.1	100	65	5
	150	220	2.2	35	3.0	100	65	5.5
	155	230	2.2	27	3.0	115	65	4
	165	220	1.6	35	3.0	105	65	4
	160	220	2.0	29	3.0	100	65	5
	155	220	2.4	30	2.9	115	62	5
	150	220	2.3	35	3.0	110	68	4
	155	220	2.2	33	3.0	105	65	4
	160	220	2.0	32	3.2	110	68	3.5
	160	220	2.0	33	3.0	115	69	5
	170	230	1.9	28	2.8	105	68	6.75
	170	240	1.4	34	3.0	100	68	5
	160	230	2.0	25	2.8	100	65	6
	170	220	2.2	29	2.8	105	65	3
1%	150	220	2.3	29	3.1	100	63	10
	155	220	2.4	30	3.0	85	66	10
	155	220	2.4	28	2.8	100	65	9
	155	210	2.8	29	3.0	85	65	8.5
	155	215	2.5	24	3.0	95	65	13.5
	155	210	2.2	26	3.0	95	67	10.5
	150	210	2.3	36	3.4	110	68	15
	160	220	2.6	33	2.8	120	70	11
	155	220	2.0	30	2.9	90	70	15
	160	215	2.1	35	3.0	95	65	12
2%	150	195	2.4	32	3.0	90	67	55
	155	205	1.9	31	2.7	100	68	35
	150	210	3.0	34	2.8	100	65	23
	150	210	2.5	36	2.9	105	68	25
	150	210	2.6	32	3.0	110	68	30
	150	200	3.5	22	3.0	95	63	28

Alloy Additions to Gray Cast Iron

8

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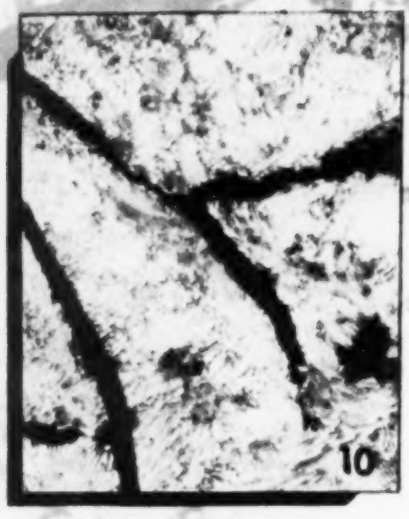
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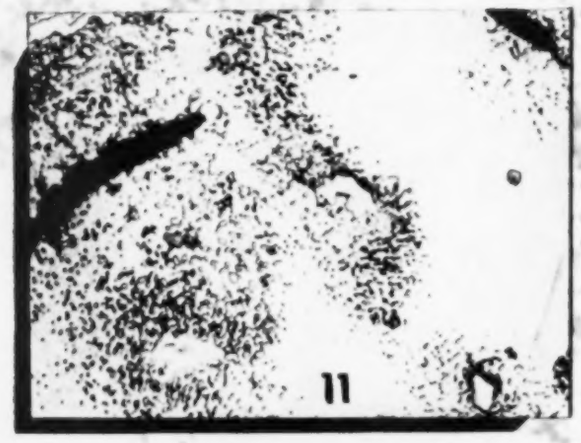
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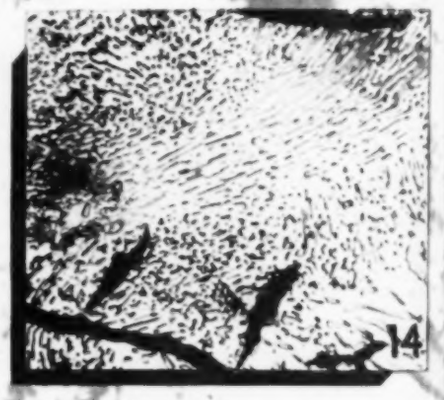
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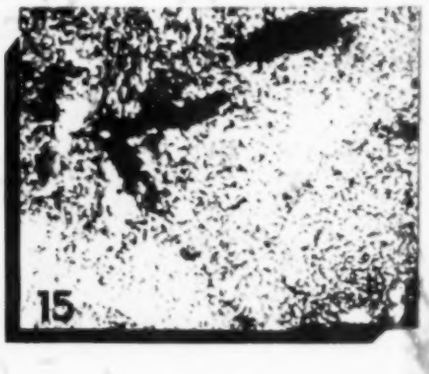
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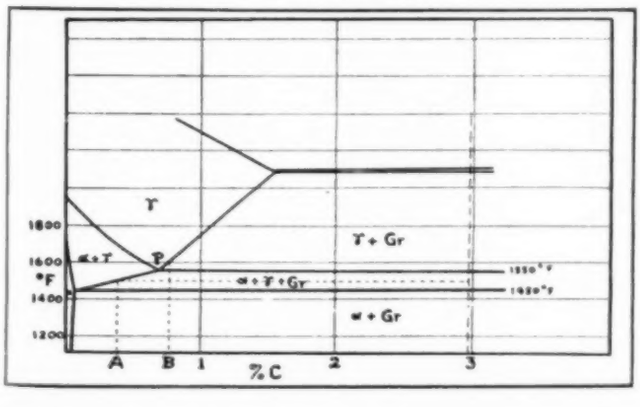
MECHANISM of softening pearlitic gray cast iron by heating to temperatures below the critical temperature has been found to involve two distinct steps: (1) spheroidization of the carbide lamellae and (2) a migration of carbon to the graphite flakes in the vicinity. These two factors have been illustrated and discussed in a recent publication[5]. Apparently the two reactions can take place simultaneously. Since the iron is in the alpha state at these temperatures, the graphitization which takes place depends upon the rate of diffusion of carbon through alpha iron. The *hardness breakdown* in this temperature range will indicate, to some extent, the effects of the various elements or combination of elements upon this rate of diffusion at the different temperatures used. If the irons were held in the temperature range of 1300 to 1400 degrees Fahr. long enough, complete graphitization would probably be accomplished in each one, the alloying elements affecting the *rates* of spheroidization and graphitization but not the equilibrium products at these temperatures.

The irons containing chromium (Nos. 2, 8, 12, 13 and 14) offered the greatest resistance to *hardness breakdown* at temperatures in the range 1100 to 1400 degrees Fahr. After annealing at 1400 degrees Fahr., the chromium-molybdenum iron, No. 8, possessed the highest hardness and highest tensile strength of the entire group. It is interesting to note that this iron did not suffer a loss in tensile strength even though its hardness was reduced from 262 to 217 brinell. At the latter hardness the iron was as readily machined

Fig. 8—Plain iron after annealing at 1400 degrees Fahr. Brinell 143. Fig. 9—No. 7 iron after annealing at 1400 degrees. Brinell 156. Fig. 10—Plain iron as-cast. Brinell 212. Fig. 11—No. 9 iron after annealing at 1400 degrees. Brinell 187. Fig. 12—No. 7 iron annealed at 1225 degrees. Brinell 212. Fig. 13—No. 8 iron after annealing at 1400 degrees. Brinell 217. Fig. 14—Iron No. 2 after annealing at 1400 degrees. Brinell 207. Fig. 15—Iron No. 10 after annealing at 1225 degrees. Brinell 217. All etched in 2 per cent nital, 1000 diameters. Fig. 16—Schematic diagram of stable equilibrium in gray iron. Fig. 17—Structural influence on tensile properties of eutectoid steel at identical hardness between lamellar (pearlite) and spheroidal (heat-treated) structures



By G. A. Timmons and V. A. Crosby

Climax Molybdenum Co., Detroit

as the plain iron, as cast, yet the tensile strength was vastly superior. After *annealing* this iron to reduce its hardness to 217, it still possessed a tensile strength superior to eight of the other irons in the as cast condition.

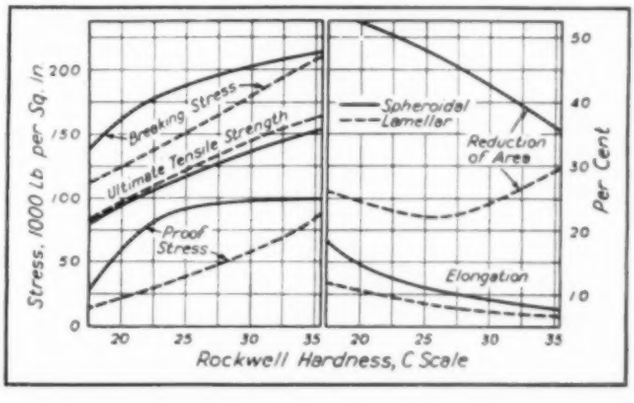
Comparisons of the microstructures of the irons after *annealing* at 1400 degrees Fahr. with the original as-cast structures shows the manner in which the pearlite was spheroidized and carbon migrated to the graphite flakes. It will be noted that, in most of the structures produced by annealing at 1400 degrees Fahr., certain areas are practically carbide-free while others contain relatively large concentrations of carbides. Generally, the areas of high concentration of carbide spheroids are associated with graphite or primary cementite.

Explains Freezing of Cast Iron

They usually bound areas which correspond to portions of austenite dendrites or cell-like patterns from the solidification of the eutectic. Note particularly Figs. 8, 9 and 11. The freezing of cast iron starts, upon cooling from a temperature at which the iron is completely molten, by the formation of austenite dendrites which continue to grow until the temperature is attained at which the eutectic starts to solidify. This eutectic is then forced to solidify in the interstices of the original dendrites.

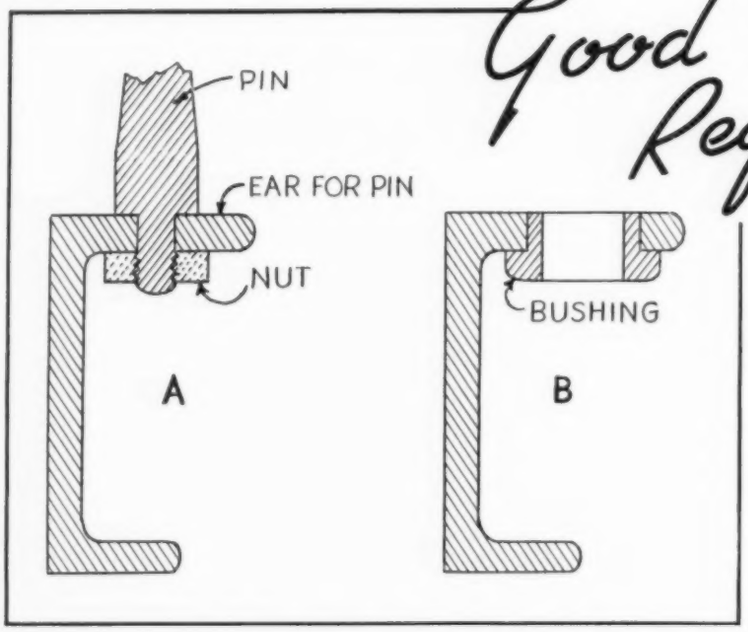
Boyles[6] has shown that graphite is formed from the melt during the solidification of this eutectic, which apparently takes place by a growth of cells which start from nuclei and grow outward from those nuclei. The last metal to freeze contains the greatest alloy content. Primary cementite and ledeburite also result from the freezing of the eutectic composition which must contain higher concentrations of alloying elements than the original austenite dendrites.

It is probable that these concentrations of alloying elements stabilize the carbides or reduce the rate of diffusion of (*Please turn to page* 144)



Good Flasks Required in Nonferrous Foundry

By N. K. B. Patch



Flask cross section showing pin and bushing attachment. Not drawn to scale

IN PREVIOUS articles dealing with gating of castings in the nonferrous foundry little mention has been made of the importance of rigidity in supporting the sand forming the mold. A great many foundrymen are of the opinion that any old flask knocked together out of whatever lumber is available so long as it holds the sand without its falling out during the operation of assembling the mold it will answer the purpose.

That is certainly an exaggeration of truth for there is nothing quite so important in production of accurate castings that will fit jigs properly as having the sand properly supported by solid, well-made, accurately fitted flasks that will insure accuracy of match of cope with drag. For small work on a mass production basis light cast iron flasks frequently will serve, particularly in the hands of experienced men who are willing to take a little more care of the equipment.

In the mass production foundry where interchangeability of castings is one of the prerequisites and a minimum of defectives is a prime requisite, flasks made of steel or aluminum of the right thickness to insure rigidity, of the proper design to increase this rigidity to its maximum, and accurately machined with stout accurate pins and removable bushings in the pin holes will pay dividends in insuring accuracy of product and long life of the equipment.

Where castings are being made of sufficient mass to develop more than the normal pressure on molds the flasks must be even more rigid and strong to insure castings that will be true to pattern and consequently will not contain excessive metal that must be wasted in machining to blue print sizes. Many foundrymen do not appreciate the importance of accurate flask equipment and are attempting to produce their product with this equipment of a very poor grade and with almost no attention to its maintenance of accuracy or to the proper amount of repair.

Furthermore, there is a wide choice of equipment available in the market and the foundryman who selects his flask equipment because it is cheap rather than because it is the best will suffer in the quality of his product and furthermore; will be forced to replace his equipment much sooner than his competitor who picks the better flask equipment in the first place. Snap flasks are good equipment if they are of the highest quality and their condition is maintained at the highest possible point of repair and accurate fitting.

Must Be Accurate

Where snap flasks are used jackets or bands, of course, must be used also to support the sand while under the pressure of the molten metal. The jackets or bands must be accurate and strong. Good equipment pays dividends in the foundry. This is particularly true in the case of flasks, core boxes and the like, that must hold the sand accurately in order to insure accuracy of the castings produced.

Where gray iron flasks are used some form of annealing is beneficial but at any rate they should be allowed to stand around or age for some time after they have been rough machined before finally machining them to the accuracy demanded for the best results. Such aging permits relief of strains (*Please turn to page* 130)

DEFENSE PRODUCTION

Aided by

X-ray Examination

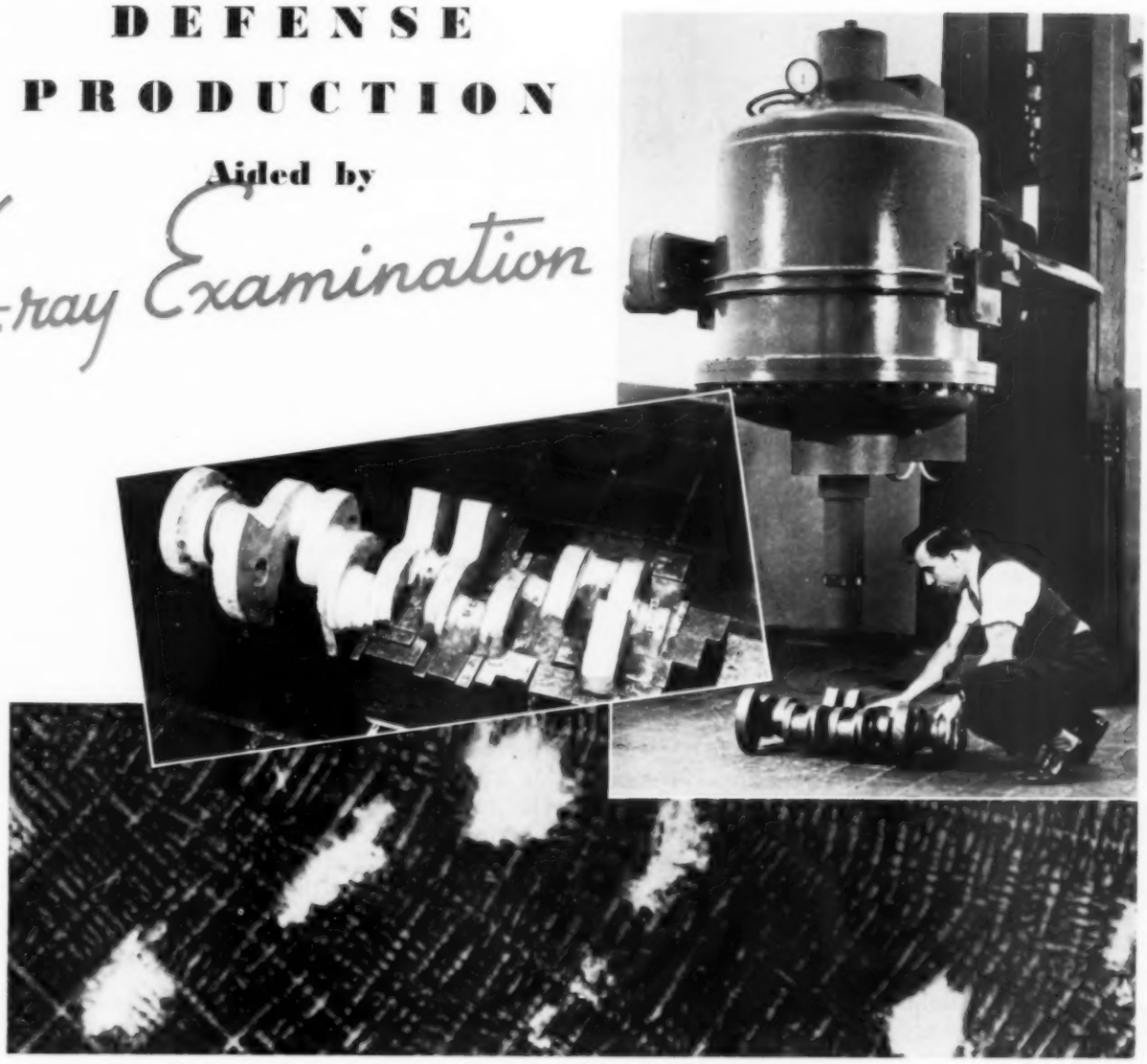


Fig. 1 (Left above)—Crankshaft blocked for X-raying on 400 kilovolt unit. Fig. 2 (Above)—Microradiograph of cast aluminum alloy, 30 diameters. Fig. 3 (Right above)—X-raying crankshaft on new 1000 kilovolt unit

THE Ford Motor Co. has been using x-ray examination since 1930 in the development of production castings. These castings have been designed with reasonably large strength safety factors so that the x-ray examination of the total production is not warranted. Extensive use of x-ray examination in the development of proper foundry techniques had until recently been sufficient.

National defense requirements of a greatly expanded aircraft production, in which the Ford Motor Co. is taking a major part, has necessitated the extension of x-ray examination to either all or part of the total casting production destined for aircraft use. Commitment other than aircraft also requires a large expansion in the use of x-ray for foundry development purposes. X-ray facilities have been selected and designed to fulfil these two functions.

Production x-ray units have been designed to handle the huge volume of castings destined for large volume airplane construction projects. In addition to the highly specialized production x-ray units, the largest and it is believed most complete assemblage of x-ray equipment in the world is being added for foundry development use and semiproduction checking. The degree of flexibility and power rating of each of these units was selected for a specific use to allow maximum efficiency of x-ray examination. These units produce useful x-ray radiation with applied voltages of from 5000 to 1,000,000 volts. The x-ray radiation produced by each of certain ranges of voltage is best adapted for the examination of certain metals and certain sizes of section. A brief de-

(*Please turn to page* 148)

By DON M. McCUTCHEON
Chemical and Metallurgical Department
Ford Motor Co., Dearborn, Mich.

QUESTIONS and ANSWERS

Facing Sand Binder in Aluminum Alloy Work Is Too Strong

Making aluminum matchplates in Windsor Locks and Albany No. 0 sand we spray the face with a thin solution of a water soluble binder and then dry it with a torch. In many instances the surface of the mold develops a great number of cracks. A green sand face also cracks and leaves ridges on the plate. Can you suggest a sand mixture that can be used without spraying or drying?

The fact that the majority of aluminum matchplates are cast in green sand molds would seem to indicate that your spraying and drying are over done. Normally, this treatment produces a cleaner and smoother face than plain green sand. A strong binder dried with a torch produces a hard skin on the face of the mold. This hard skin is not as elastic as the sand behind it and as a result it cracks when heat is applied. The suggested remedy is to use a much weaker solution and a milder application of the torch. Some of the roughness on the face of the plate may be caused by steam. The drag must be vented to a greater extent than usual to provide easy and rapid exit of all gas and steam. Channels are cut in the sand which comes into contact with the bottom board. Small wedges inserted on the four sides prevent the bottom board from coming into actual contact with the lower edges of the drag. In certain instances it is advisable to vent the space between bottom board and drag with a long wire.

Blast Employed in Cupola Is Higher Than Required

We have a new cupola 42 inches inside diameter with a single row of six 4 x 9½-inch tuyeres 9 inches above sand bottom. Coke bed is 40 inches above top of tuyeres and first iron appears 5 minutes after blower is started. Wind box pressure is 8 ounces and volume of blast is 4500 cubic feet per minute. Melting rate is only 3½ tons per hour and the iron is too cold for light castings. Each charge is 1500 pounds pig and scrap and 160 pounds coke. When we use another and larger blower, throttled down, the cupola operates satisfactorily.

Under the conditions outlined our first suggestion is that you take the question up with the cupola maker. It is to his interest that the cupola should perform satisfactorily. The maker either will send you complete instructions, or will send a personal representative to check up on conditions and show you what to do and how to do it. In the meantime we direct your attention to the fact that you are blowing a great deal more air than the cupola needs for efficient operation. A 42-inch cupola has a normal melting capacity between 6 and 7 tons per hour, depending usually on the weight and composition of the charge. A charge made up of large, heavy pieces of iron will not melt as rapidly as a charge of small, light, pieces. For a maximum melting rate of 7 tons per hour, the volume of air required is approximately 210,000 cubic feet, or 3500 cubic feet per minute. By blowing in 4500 cubic feet per minute, you are driving 1000 cubic feet of air that cannot possibly be consumed. You will either have to slow down the blower, or change the pulleys.

Bronze Plates for Paper Mills May Vary in Composition

We are interested in securing information with reference to the bronze plates extensivly usd in pulp mills. We understand the mixture is chiefly copper and tin, with small percentages of lead and zinc. We understand that they are cast after which they are finished with fine slots. We will greatly appreciate it if you will give us some information regarding the casting of these plates.

Plates used in the sulphite paper industry are made from a variety of compositions in both cast and wrought form. Wrought sheets usually are 95 per cent copper, 5 per cent tin, cold worked by rolling to harden them so that they resist wear. Other compositions also are used in this same condition. In the cast condition, a composition such as 86 per cent copper, 12 per cent tin, 0.5 per cent lead and 1.5 per cent zinc very commonly is used, and has given good results for screen plates as well as pump bodies, impellers, etc.

In casting there should be no difficulty. Most important point to remember is careful control of composition so that the ratio of the different elements is maintained within relatively close limits. To superheat the alloy until the zinc is vaporized is extremely bad practice. The castings should be poured at low temperature. Therefore, gating has to be such as will permit low temperature pouring without cold shuts or other defects.

A number of mills use aluminum bronze both as cast and after rolling. Aluminum bronze without iron is the proper composition to use since any iron present in the bronze might result in iron rust which would discolor the pulp. In the cast condition the 90 per cent copper, 10 per cent aluminum is used most commonly. In casting this alloy it should be remembered that agitation of the metal as it enters the mold tends to form dross or scum which may be entangled in the surface of the casting and result in serious defects. Therefore, good castings demand gating which will bring the metal into the mold quietly without any nozzle effect or agitation. Since this composition is of the high shrinkage variety it needs adequate risers and the risers should be the last to be filled so that they are the last to cool.

Composition Is Not Suitable For Enameling Purposes

We would like to have your opinion on the suitability of our cast iron for vitreous enameling. It analyzes, total carbon 3.20 to 3.30 per cent, silicon 2.20 to 2.30 per cent, sulphur 0.11 to 0.12 per cent, phosphorus 0.30 to 0.40 per cent, manganese 0.60 to 0.70 per cent. If any of the elements are not correct, which are they, and how much correction do they need? What are the reasons for them having to be so? We have found this analysis very suitable for cast iron bases for flat irons.

The composition you give for the iron you are employing for bases for flat irons might be suitable for enameling purposes, but from available information on the subject, it appears that the silicon content and total carbon content are somewhat low for the best results. Johnston states that the following composition is most satisfactory for enameling purposes: Silicon 2.40 to 2.65 per cent; sulphur 0.06 to 0.09 per cent; phosphorus 0.65 to 0.80 per cent; manganese 0.35 to 0.55 per cent, and total carbon 3.30 to 3.50 per cent. Schall recommends a composition containing 2.40 per cent silicon; 0.065 to 0.075 per cent sulphur; 0.70 to 0.75 per cent phosphorus; 0.75 to 0.85 per cent manganese; and 3.40 to 3.50 per cent total carbon. Another composition which is satisfactory to give good results is one containing 2.50 per cent silicon; 0.08 per cent sulphur; 0.70 per cent phosphorus; 0.70 per cent manganese, and 3.40 per cent total carbon. One of the essential features of iron which is to be enameled is that it be a comparatively soft iron in foundry parlance, in other words, as little as possible of the carbon be in the combined form. Investigations seem to indicate that carbon in the combined form near or at the surface of the casting during the process of enameling, breaks down into graphite and forms free carbon monoxide which causes the formation of bubbles in the enamel coating. Hence it is necessary to eliminate as much as possible any tendency toward what is termed micro-chill resulting from composition or cooling conditions. As you undoubtedly know, the micro-chill or skin chill would be high in combined carbon which would break down under the high temperatures employed in enameling to cause the trouble previously mentioned.

Wants To Know Cupola Mix For Making Converter Steel

In making converter steel, what mixture, using as much steel scrap as possible, should be charged into the cupola? Can all steel scrap be used?

In making converter steel, there are some limitations as to the composition of the iron emerging from the cupola in order that steel of the desired composition may be obtained. So far as we know, all steel scrap is not generally used since a certain amount of pig iron is included. For example Simonson states that previous to blowing, the iron should have a composition containing from 1.80 to 2.10 per cent silicon; 0.60 to 1.00 per cent manganese; about 3 per cent total carbon; and sulphur and phosphorus as low as possible. Skeates states that at a plant where the converter process is used, the iron from the cupola contains approximately 2.02 per cent silicon; 0.50 per cent manganese; 3 per cent carbon; 0.031 per cent phosphorus; and 0.035 per cent sulphur (metal desulphurized with sodium carbonate).

Skeates also states that the average charges melted in the cupola are composed of 300 pounds low phosphorus pig iron, 1000 pounds return scrap, 900 pounds purchased scrap and 100 pounds 50 per cent ferrosilicon. No information is given on the composition of the pig iron and scrap, but you will note that the addition of 100 pounds 50 per cent ferrosilicon will take care of any lack of silicon in the other material in the charge. Use of ferrosilicon would point to the possibility of using an all steel scrap charge provided some ferromanganese was added to bring that up to the desired point, but possibly it is a question of economics whether large additions of ferroalloys might not make the resulting steel rather difficult to produce with priorities, etc.

GANGWAY! By J. A. Patterson

"Personally, I think inheritin' that money from his uncle, has went to Sneed's head."

Cores Cleaned From Steel Castings

We shall appreciate a formula for core sand for a steel casting, weight 200 pounds with a core 16 inches in length and 6 inches in diameter. If we make the core hard we find checks in the casting. If we make the core soft, the metal burns in. At present we use an oil sand mixture. The casting is poured at the bottom.

You are up against a problem that arises every now and again in every steel foundry, a core that lets the metal burn in if it is too soft, and produces checks and cracks in the casting if it is too hard. Usually each of these is an individual problem, requiring some experimental work. You are familiar with the use of sawdust as an agent for promoting disintegration of the core after the casting is poured.

More than the usual number of vent openings sometimes serves the same purpose. A shell core filled with ordinary floor sand answers the purpose under other conditions. The following mixture produces a smooth interior in and runs readily from steel shells 40 inches in length and 11 inches in diameter at the bilge, tapered gradually to both ends: Raw silica sand 1350 pounds, silica flour 250 pounds, core oil 1 to 30 by volume and 1 to 46 by weight and water 6¾ gallons. The batch is mixed dry for 1 minute in a muller type mixer. Water is added slowly for 1 minute and the batch is mixed for 5½ minutes. Then the oil is added slowly while the batch is mixed for 2 minutes.

Make Sash Weights In Iron Molds

We make about 500 tons of sash weights per year. The molds are made in green sand on various types of molding machines. Is it possible to transfer this work over to permanent molds. We need the space to fill orders for other types of castings. We have heard that sash weights can be made with great success in permanent molds. We shall appreciate information. Also if available you may send us any books or literature on the subject.

So far as we know no book has been published dealing exclusively with the subject of permanent molds. References ranging in length from brief questions and answers to complete illustrated articles of several pages have been presented in THE FOUNDRY on many occasions. For the amount required, approximately 10 tons per week or 2 tons per day, your present method of manufacture is probably the most satisfactory. You do not say whether you melt two or three special charges in the cupola each day, or devote the entire floor space to sash weight molds once or twice per week.

Permanent molds of various types have been employed on many occasions for making sash weights. In one type the molds are set up in a long battery in a shallow pit. The molds are split vertically and each half is hollow. A stream of water is kept flowing through the battery while the molds are in service. In the second type each half mold is a solid piece of metal. The molds are mounted on a revolving table and are made by a Pennsylvania firm. Usual number of molds is four, but since all the machines are practically custom made jobs, it is probable that larger or smaller units are available. It is claimed that the water cooled molds do not operate as smoothly as one might expect. Apparently trifling defects cause trouble; molds buckle and leak, clamps or hinges jam with sand or metal, rubber water connections are burned or develop cracks. In recent years a Michigan firm has developed to a high state of perfection the art of casting in air cooled permanent molds. If you attempt to build the molds in your own shop considerable experimental work will be required for successful development.

Iron Plugs Used in Pouring Basin

On several occasions we have seen reference to the use of plugs in pouring basins. What material is in these plugs. Do they extend above the metal in the basin? How are they removed?

The practice of plugging the sprue until the pouring basin is filled dates back to the earliest days in the foundry when ladles and cranes were not available. The practice still is found in European countries, but never has been adopted to any great extent on this side of the ocean. Extended reference to the use of plugs appears in a recent article in THE FOUNDRY dealing with the production of large marine engine castings. The plug is a short cast iron cone attached to a steel rod. The size of the plug and the length of the rod depend on the diameter of the sprue and the depth of the basin.

Mold for the conical plug is made in an open sand mold. The rod is suspended directly above the open mold with the lower end of the rod extending about to the bottom of the mold. This end is nicked to give the metal a firm grip. The upper end of the rod is formed into an eye. After the basin is filled with metal an attendant inserts the bent end of the rod into the eye and lifts the plug. Each time the plug is used it is black washed and dried. Usually a coating of plumbago is rubbed around the sprue opening. Preferably a dry sand core with a tapered opening in the center is bedded in the bottom of the pouring basin. Reference here is to cast iron plugs for gray iron castings.

Air To Melt Bronze In the Cupola

In melting iron in the cupola we allow the first iron to flow until it is quite hot then stop the tap hole. Should we pursue the same practice in melting a bronze heat. In melting bronze we have been advised to shut off the blast after the first tap, the remainder of the bronze will melt and run down without any blast. Should the tuyeres be opened to supply air by natural draft during this period?

It is not necessary to keep the tap hole open at the beginning of a heat for either iron or bronze. In modern cupola practice the tap hole is stopped before the blower is started and this prevents the wild blowing of air, sparks and drops of iron. The usual excuse is that the flame heats the tap hole and dries the spout lining. To a certain extent this is true and the item is not of major importance. However, the cupola tender who is particular about the little niceties of practice does not care to have a wild blast blowing through the tap hole. He places a piece of stock core in the tap hole and lets it project 4 or 5 inches on the inside.

A small pinch of clay around the outer end seals the hole. When the iron has risen almost to the tuyeres, the cupola tender runs a small rod through the core, which by this time is burned and crumbles readily. The accumulated iron then runs into the waiting ladle and is fit for use. Try this practice once or twice and you never will go back to the sloppy, wasteful former method. This applies to either iron or bronze. Touching on the question of shutting off the blast on a bronze heat after the first tap, that only applies where one or two additional charges remain to be melted. Obviously where the cupola is filled to the door, or where melting extends over a considerable period, the blast must be applied at regular intervals to maintain the necessary melting temperature. Where only one or two charges are involved, the blast may be shut off after the first tap. The tuyeres are opened and the natural draft usually will finish the heat.

ALLOYS

Timely information about metals...
CATALOGUED for your convenience

Specific answers to many of your questions about the selection, fabrication and uses of Nickel alloys are available to you quickly from our files.

This fund of helpful information we have gathered, checked and condensed into convenient printed form. The graphs, charts and shop guides are especially useful to men handling new materials or performing unfamiliar operations . . . and to new employees. This literature is available on request.

You are also offered the assistance of our technical staff in solving material problems arising from a temporary lack of Nickel. These engineers are offering timely suggestions to many vital industries during the present emergency.

Why not drop us a card asking for list of available literature. Your request for the assistance will receive prompt attention.

NICKEL

THE INTERNATIONAL NICKEL COMPANY, INC. 67 WALL STREET NEW YORK, N. Y.

MEN OF INDUSTRY

WADE H. STINE, formerly with the Beckett Bronze Co., Muncie, Ind., now is foundry superintendent, Progress Pattern Co., St. Paul. Mr. Stine received his education in the Chicago schools and his technical training at the University of Notre Dame, South Bend, Ind. He began his foundry career 19 years ago with the Northern Indiana Brass Co., Elkhart, Ind., where he served in various positions connected with foundry operation up to core department foreman and foundry foreman.

♦ ♦ ♦

GEORGE A. ZABEL, recently appointed assistant foundry superintendent Universal Foundry Co., Oshkosh, Wis. and well known in foundry circles through his long connection with the Wisconsin Vocational schools, served an indentured apprenticeship with the Liberty Foundry Inc., Wauwatosa, Wis., and the Spring City Foundry, Waukesha, Wis., now the Grede Foundries. He served as cupola foreman at the Spring City Foundry Co., plant in 1931 and 1932. He became foundry instructor for 10 Wisconsin Vocational schools in 1934 and held that position until 1941. He is a member of the A.F.A. apprentice contest committee and a member of the Wisconsin Chapter A. F. A. apprenticeship committee.

♦ ♦ ♦

ROBERT K. GLASS, field contact metallurgist on pig iron and steel for Republic Steel Corp., Buffalo, has been elected chairman of the Western New York Chapter of the A. F. A. Mr. Glass has had considerable experience in the iron and steel industry, starting to work at the age of 16 at the Carnegie Steel Co.'s plant in Columbus, O., as a laborer on the blast furnace. Following summers he was employed at the Columbus Fuel & Iron Blast Furnaces as a blacksmith's helper, by Pennsylvania Railroad Co., and in the gold mines at Deadwood, S. Dak. He then entered Ohio State University for one year. After various jobs in gray iron, malleable and nonferrous foundries, Mr. Glass became connected with the Jeffrey Mfg. Co., where he worked and also attended college for the following 2 years. He then joined the Buckeye Steel Castings Co., as chemist, metallographist and held various other positions during the 5-year period he was connected with that concern. His next position was as chemist and metallurgist, and later sales manager, Atlas Brass Foundry Co. Succeeding connections were with General Electric Co., and Hydraulic Press Mfg. Co. Prior to his joining Republic Steel Corp. in 1935, he had established his own business as a foundry consultant.

♦ ♦ ♦

FRED J. WALLS, International Nickel Co., Detroit, and a director of the A. F. A., recently was appointed chairman of the defense committee of the American Foundrymen's Association. Other members of the committee are as follows: R. J. ALLEN, Worthington Pump & Machinery Co., Harrison, N. J.; H. BORNSTEIN, Deere & Co., Moline, Ill.; W. J. CORBETT, Atlas Steel Casting Co., Buffalo; and D. P. FORBES, Gunite Foundries Corp., Rockford, Ill.

♦ ♦ ♦

LOUIS B. NEUMILLER has been elected president, Caterpillar Tractor Co., Peoria, Ill., and succeeds B. C. HEACOCK, president since 1930, who becomes chairman of the executive committee. Mr. Neumiller is a native of Peoria, educated in the schools of that city. He joined the Caterpillar company 26 years ago as a stenographer and blue print clerk in the engineering department, and in the following years has served in many capacities in the company. Mr. Heacock, who becomes chairman of the executive committee will have headquarters in Peoria, although at the present his time and attention are occupied in Washington where he is serving as special assistant to under-secretary of war, Robert Patterson.

T. J. CONNOR, vice president, has

(*Continued on page* 72)

George A. Zabel

Robert K. Glass

Louis B. Neumiller

Wade H. Stine

OUR BIGGEST JOB...AND YOURS

TODAY our furnaces—like other pig iron producers throughout the nation--are in high gear for national defense. Naturally we regret deeply that defense requirements are making it impossible for us to meet all the requirements of our valued customers in this emergency. But we know that our good friends in the foundry trade, who are also making sacrifices and doing there full, patriotic part to speed up defense, share our pride in the performance of the biggest job to which iron makers and iron moulders have ever welded their joint all-out efforts--preserving the priceless heritage of American freedom.

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

America's Largest Completely Integrated and Entirely Independent Merchant Iron Producer

(*Continued from page* 70)

been assigned general supervision of the industrial relations department, and training and public relations department in addition to the departments of manufacturing, engineering and purchasing, which he previously administered.

T. R. FARLEY, vice president, has been assigned direction of the parts and service departments, duties he will handle in addition to direction of the merchandise department. General supervision of the traffic department, formerly conducted by Mr. Farley, has been assigned WILLIAM BLACKIE, company controller.

♦ ♦ ♦

WILLIAM A. BALL JR., recently elected chairman of the Cincinnati District Chapter of the A. F. A., was born and raised in Pittsburgh, and he is a graduate of the Carnegie Institute of Technology, Pittsburgh. After a 2 years' apprentice course in the foundries of that city he served as foreman in the foundry of the Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., and two years as assistant superintendent of the Canton Steel Foundry Co., Canton, O. The following two years Mr. Ball was superintendent of the iron and brass foundries, Morgan Engineering Co., Alliance, O., and for the past 20 years he has been superintendent of the foundry for the Edna Brass Mfg. Co., Cincinnati.

♦ ♦ ♦

DR. CHAMPION H. MATHEWSON, head of the department of metallurgy, Yale University, was honored by the 115 members of the Yale Metallurgical Alumni on Friday and Saturday, Oct. 3 and 4. At a dinner held Oct. 3, at New Haven, Conn., Dr. Mathewson was presented with a commemoratory volume prepared by his former students in honor of his sixtieth birthday, Oct. 7. The volume of 215 pages contains 19 technical papers on physical metallurgy written for the occasion by graduates of the Department of Metallurgy, also an appreciation written by Dr. Zay Jeffries, a biography by Prof. Arthur Phillips, and a history of the department.

♦ ♦ ♦

C. H. MORKEN, a general superintendent, Carondelet Foundry Co., St. Louis, has been elected chairman of the St. Louis District Chapter of the A.F.A. Mr. Morken was graduated from the University of Minnesota in 1922, following which he became chief chemist for J. R. Hoven Co., Minneapolis, consulting foundry engineers. From 1925 to 1930 he served as chief metallurgist, the Ohio Brass Co., Mansfield, O. The following six years he was connected with the Detroit Electric Furnace Co., Detroit, as foundry engineer. In 1936 he joined the Carondelet Foundry Co.

♦ ♦ ♦

EARL F. OYSTER, Cleveland, recently has accepted the position of chief engineer, William H. Nicholls Co. Inc., Richmond Hill, Long Island, N. Y. Mr. Oyster first was employed by the Alliance Machine Co., Alliance, O. In 1914 he joined the Osborn Mfg. Co., Cleveland, as mechanical engineer, and later became chief engineer. He resigned that position to become one of the founders of SPO Inc., Cleveland.

♦ ♦ ♦

G. K. VIALL, vice president, Chain Belt Co., Milwaukee, has been appointed head of a new division of research and development now being organized by the company. Mr. Viall has been connected with Chain Belt since 1921 in various capacities, including chief engineer of the chain division, assistant to the president and works manager. In assuming his new position, he will also retain his position as vice president in charge of the construction machinery division.

B. F. DEVINE, with Chain Belt since 1909, has been promoted from sales manager of the construction division to the position of manager of that division. Mr. Devine has served in the purchasing department, engineering sales department, and later as assistant sales manager, construction machinery division. In his new position he also will supervise the management of sales of this division.

♦ ♦ ♦

EDGAR F. HECKERT has been appointed special assistant to the general works manager, York Ice Machinery Corp., York, Pa. Mr. Heckert formerly was manager of the service department of the company. He is a native of York, Pa., and received a bachelor science degree in electrical engineering at Pennsylvania State College, after which he became connected with the General Electric Co., and the Southern Utilities Corp. In 1909 he joined the York corporation as a student installation engineer, and several years later became assistant manager of the service department, the position he held at the time of his appointment as special assistant to the works manager.

♦ ♦ ♦

WILLIAM F. LAMOREAUX has been appointed director of research, Mechanite Corp., Pittsburgh. Mr. Lamoreaux for many years was vice president, general manager and a director of the Ducktown Chemical & Iron Co., Isabella, Tenn.

♦ ♦ ♦

MRS. ELSA THEOBALD GUENTHER, operator of the Guenther Foundry Co., Columbus, O., has given up the foundry business. The plant was razed Sept. 6. The company was acquired in 1911 by Adolph Theobald, Mrs. Guenther's father, her brother Adolph Jr., and her husband Charles. In 1927 when Mr. Guenther became ill, his wife took over, and operated the foundry for the past 14 years.

♦ ♦ ♦

WALTER E. HAWKINSON, treasurer, Allis-Chalmers Mfg. Co., Milwaukee, since 1936, has been elected to the joint position of secretary-treasurer. He assumes the secretarial duties of

(*Concluded on page* 74)

William A. Ball Jr.

C. H. Morken

Dr. Champion H. Mathewson

Earl F. Oyster

HERE'S one good way TO GET sound NON-FERROUS castings

YOU CAN STOP TEARING YOUR HAIR OVER SLOW PRODUCTION AND HIGH COSTS, if you're casting aluminum, magnesium, or other non-ferrous metals. For Truline* Binder can increase production and save trouble in *your* foundry, as it is doing in many others.

To begin with, cores made with Truline Binder collapse *fast*, so fast that there's little chance for core resistance to cause shrinkage cracks. That means they're just the thing for tough jobs in brass, bronze, magnesium, and aluminum.

Convenient-size Bag Is Easy to Handle

Then, too, you'll find that sand is easily and quickly removed, which cuts down time lost in the cleaning room. Shorter baking times give you more cores per oven per hour. Or you can bake cores as low as 300° F. This is important for magnesium, for it means you can put inhibitors right in the mix—instead of spraying on the baked core surfaces.

So stop worrying about your troubles with those high-shrinkage metals. Just clip this coupon to your letterhead and mail today. We'll see that you get information about what Truline Binder can do for you, and a sample if you want it.

HOW TRULINE BINDER INCREASES PRODUCTION IN MANY FOUNDRIES

SAVES TIME ON BAKING Truline Binder bakes through quickly—increasing core oven output. Time saving is sometimes as much as 30%.

SAVES TIME ON CLEANING Cores collapse quickly; this makes cleaning faster. Some foundries have cut cleaning time 50% with Truline Binder.

SAVES TIME ON RAMMING Flowability of Truline Binder mix speeds ramming, particularly in green sand facings.

*Reg. U. S. Pat. Off. by Hercules Powder Co.

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Please send ☐ Sample
☐ Information on how to use Truline Binder in casting:
☐ Aluminum ☐ Magnesium ☐ Brass ☐ Bronze

Name.....

Company.....

Street.....

City..... State.....

JJ-44

(*Concluded from page 72*)

WILLIAM A. THOMPSON, vice president and secretary, who resigned recently. Mr. Hawkinson started with the Allis-Chalmers company 34 years ago in the treasurer's department.

♦ ♦ ♦

JOHN A. O'BRIEN, has been elected vice president, Johns-Manville Sales Corp., New York. Mr. O'Brien will continue his duties as general sales manager of the power products and industrial department, a post he has

John A. O'Brien

held since 1938. He began his career with the company in 1915.

♦ ♦ ♦

NORMAN F. S. RUSSELL, president, United States Pipe & Foundry Co., Burlington, N. J., has been elected a director of the Cramp Shipbuilding Co., Philadelphia.

♦ ♦ ♦

H. R. BRISTOL, Bristol Co., Waterbury, Conn., has been transferred from the company's Chicago office to the office in Boston. J. E. BOOTH succeeds Mr. Bristol in the Chicago office.

♦ ♦ ♦

SAMUEL WEISS, former divisional sales manager, Semet-Solvay Co., New York, has been appointed to the Office of Price Administration, Washington, to assist in setting price regulations on coke.

♦ ♦ ♦

J. LOUIS REYNOLDS, vice president and general sales manager, Reynolds Metals Co., Louisville, Ky., was inducted recently as president general of the United States Flag Association at a meeting held in Washington.

♦ ♦ ♦

PHILIP C. ROSENTHAL has joined the research staff of Battelle Memorial Institute, Columbus, O. He will direct investigations in metallurgy, particularly the foundry practice of gray cast iron. Prior to his new appointment, Mr. Rosenthal was on the faculty of the department of metallurgy, University of Wisconsin for 4 years. He received degrees of bachelor of science and master of science in metallurgical engineering from that university. He is a member of the committee on classification of graphite flakes in cast iron of the American Foundrymen's Association, and also is a member of the American Society for Metals, and Sigma Xi, a national honorary science society.

♦ ♦ ♦

WALLACE W. LOCKWOOD has been appointed advertising manager, Taylor Instrument Companies, Rochester, N. Y., to replace ELMER E. WAY, who resigned. A graduate of Auburn High School and Syracuse University, Mr. Lockwood joined the firm in 1932 and was made assistant advertising manager in 1939.

♦ ♦ ♦

WARD F. SIMMONS, metallurgical engineer, has joined the technical staff of Battelle Memorial Institute, Columbus, O. Mr. Simmons is a graduate of the School of Mines and Metallurgy, University of Minnesota, and prior to joining Battelle, he was associated with the American Steel & Wire Co., Duluth, Minn.

♦ ♦ ♦

R. J. FORKEY has been appointed sales engineer for upper and western New York state by Norton Co., Worcester, Mass. Mr. Forkey, a graduate of Worcester Polytechnic Institute, has been connected with the company's research laboratories and the sales engineering department at the Worcester plant.

♦ ♦ ♦

STANLEY BRACKEN has been appointed general manager of manufacture, Western Electric Co., New York. Mr. Bracken has a record of 29 years service with Western Electric, having started after graduation from the University of Nebraska in 1912 as a student engineer in the Hawthorne Works.

♦ ♦ ♦

WILLIAM A. CRAIG, has been appointed purchasing agent, Link-Belt Co., for the company's Philadelphia plant to succeed the late James C. Lenahan. Mr. Craig joined Link-Belt in 1916 in the Philadelphia plant purchasing department. As assistant purchasing agent, he has been Mr. Lenahan's direct assistant for many years.

♦ ♦ ♦

A. M. DEGNER, plant manager, Surface Combustion Co., Toledo, O., has been elected president, National Association of Foremen. Vice presidents elected include: C. C. KENDRICK, Met-L-Wood Co., Chicago; NORMAN HUFF, Ford Instrument Co., Long Island City, N. Y.; and S. S. BODINE, Shell Oil Co., East St. Louis, Ill. E. F. SEVING, Sidney Grain Machinery Co., Sidney, O., has been elected treasurer, and WILLIAM E. LOEFFLER, Bowling Green, O., executive secretary.

♦ ♦ ♦

LEO A. BEHRENDT has joined the crucible division, Joseph Dixon Crucible Co., Jersey City, N. J. Mr. Behrendt's early years were spent in laboratory work in the terracotta industry. He served in the aviation corps throughout the last war, following which he completed special ceramic engineering courses at the University of Illinois. In 1926 he became superintendent of the

Leo A. Behrendt

Chicago Crucible Co., which in 1930 merged with the Naugatuck Valley Crucible Co., as the Chicago-Naugatuck Crucible Co., which changed its name in 1934 to the American Crucible Co. In 1936 he became vice president and a director as well as plant superintendent of that company, continuing until his resignation.

♦ ♦ ♦

ALFRED BOYLES, previously metallurgist at Battelle Memorial Institute, Columbus, O., is now in the research department, U. S. Pipe & Foundry Co., Burlington, N. J.

♦ ♦ ♦

A. W. THOMAS has been appointed sales manager, construction machinery division, Chain Belt Co., Milwaukee. D. A. KALTON, has been appointed assistant sales manager and A. J. FRANK, assistant to the manager of the division.

♦ ♦ ♦

CARL L. WALLFRED has been appointed to the technical staff, division of process-metallurgy research, Battelle Memorial Institute, Columbus, O. Mr. Wallfred is a graduate of the University of Minnesota, and has had 20 years' experience in chemical and metallurgical research with the U. S. bureau of mines, Northwest Research Foundation, mines experiment station, University of Minnesota, the Minnesota Mining & Mfg. Co., and A. O. Smith Corp.

Experience in many foundries is proving that a little Molybdenum often gives cast iron just the qualities needed for difficult applications.

Liners on the steam valve chest of a high pressure pump are a case in point. The manufacturer makes them of a good quality gray iron with 1.00% Molybdenum added. They are oil quenched and drawn to a hardness of 40-45 Rockwell "C". The difficult requirements for wear resistance at operating temperatures and general reliability are thus met — and with better than average economy.

Our book, "Molybdenum in Cast Iron" contains complete data on the various Molybdenum irons used in modern foundry practice. It is sent free on request.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTES FOR THE CUPOLA . FERROMOLYBDENUM FOR THE LADLE

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MOLY

THE ADVENTURES OF BILL

BY PAT DWYER **Drawings By RICHEY**

DO YOU remember," I said to Bill the other night, "a kind of a Scandinavian story about a single line railroad and two trains rushing toward each other at high speed? I forget most of the preliminary work leading up to the climax, but that never was more than an incidental feature. The hurry up boys usually omitted it altogether—"

"What do you think I am?" Bill inquired, "A magician in a high hat and a claw-hammer coat who waves a wand and brings up the answer all nicely typed on a reasonably clean white card. I suppose if there was any possible way of adding 'em together I have heard or read thousands of stories including the Scandinavian, but I would need a better mental index than you apparently credit me with to recognize the story from your description. 'A kind of a Scandinavian story,' says you.

"Does that mean that the scene of the story is laid in the territory one time located on the upper northeast corner of Europe; or does it mean that the story revolves around a Scandinavian person, over here 3 years and a voter already yat, ba yiminy! If the story is in dialect, it probably has been retired from circulation until our gabby news commentators agree on the pronunciation of names that a few years ago simply meant dots on a map.

"As for the two trains rushing toward each other at full speed on a single —Hey! Wait a minute. I hope you are not trying to put over one of your trick quiz questions. Two trains, like the two goats in an old school book story meet on a narrow mountain path. A noble picture of the two belligerents locked in a fatal embrace and tumbling into the torrent ornamented this sterling piece of literature.

"I hope you are not going to ask me how the trains passed each other."

"No. I am not going to ask you how the trains passed each other. The story just came to mind in an idle kind of a way. Seems to me it is a very nice illustration of the old inevitable history repeating itself. Listen, my dear, and you shall hear of the midnight ride of —No, that is not it. Well, listen anyway.

"Ole Oleson had a job as a locomotive fireman. A good, strong, husky, sensible lad, willing and ready to keep 'er popping at the crucial moments when the driver had to lean right earnestly on the throttle. He found favor in the eyes of these old hard nose drivers

No trouble to know what he means

and gradually became adept on the right-hand side of the cab. In a test for permanent position in the driver's seat he was given a list of 10 questions to gage his general knowledge. Nine questions presented no particular difficulty. He balked slightly at the tenth: On a single-track road two trains traveling in opposite directions, rush toward each other at a speed of 70 miles per hour. How do they pass each other?

"Ole studied the problem from every possible angle and then submitted the answer which has become a treasured piece of railroad lore: 'Dat bane helluva vay to run a railroad Ah kvit.'

"I don't know much about running a railroad, but I wonder what Ole would do and say if he was running a foundry at what all journeymen speakers and writers describe as a crucial period in the world's history. I'd like to see a period that was not crucial.

"Believe me, the foundrymen are having more trouble hovering around the fringes of this war than they had in the last war when they were in up to their necks. During the 1914-1918 period they were plagued by a flock of experts that apparently like these here 7-year locusts had been developing in the ground or in the woodwork. Armed with a brief case containing a ham or cheese sandwich on one side and a 24-page mimeographed report in the other compartment, the sandwich sustained life while the hunter was trailing big business to its lair in the financial jungle.

"No one ever read the mimeographed script. Invariably the deal was put over orally. 'Twas a profitable and fertile field for many years for the introduction of schemes designed and in fact guaranteed to reduce expeses, increase production, pay dividends, operate as smooth as a dose of goose grease and create a general atmosphere of sweetness and light.

"In some instances results were remarkable. In others they were not—well, they were not so good. Pride and the natural human reluctance to admit being stung, or being guilty of a mistake in judgment have kept systems in use long after actual figures containing all the items have confirmed the opinions of doubting Thomases.

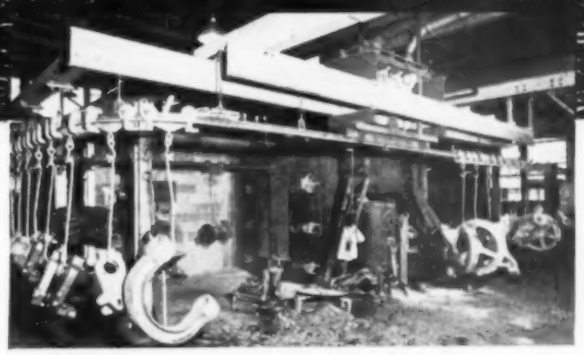
"In spite of this and other handicaps we managed to pull through. We made all the castings needed by greatly accelerated industry. We made 'em for the army and for the navy and we loaded ships down to the hatches and sent them

(*Continued on page* 78)

The Keynote of Manufacturing Today is EFFICIENCY

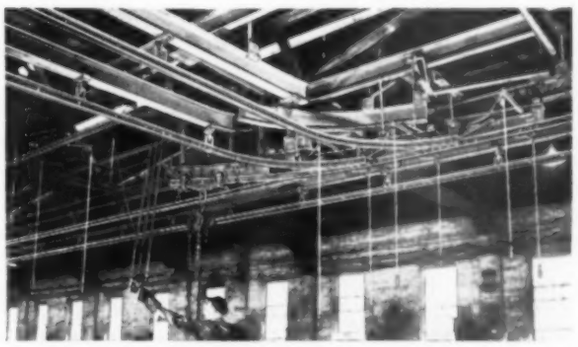
AMERICAN MONORAIL

OVERHEAD HANDLING EQUIPMENT



★ Heavy castings easily handled. Track section in center lowers to engage hook with load.

WASTE is out . . . in time, materials and man power. American MonoRail Overhead Handling Equipment has proven to hundreds of manufacturers to be the real answer to materials handling efficiency. Regardless of the type of business, there is a system suited to your problems. If you have a difficult or a costly handling operation, why not let an American MonoRail Engineer suggest a solution. Many times our engineers have solved problems that others claim "can't be done." Definite recommendations will be made and a detailed plan submitted showing just how an American MonoRail system can carry your product at the lowest possible cost and the highest possible efficiency. This service is without cost or obligation. Write us today.



★ Air lift transfers 90 tons of metal per day to system on higher level.

★ Easy rolling trolleys assure quick and safe distribution of metal on the pouring floor.

Write for copy of "Blue Book" showing hundreds of illustrations.

THE AMERICAN MONORAIL CO.

13104 ATHENS AVENUE CLEVELAND, OHIO

(*Continued from page* 76)

across the ocean. We had enough raw material for every job. We even had some stuff left over to start the anvils and hammers ringing while converting the returned swords into plow points.

"In those days the men who sat in high places assumed that the foundry men knew infinitely more than any other persons about foundry problems. Under present conditions these men or their successors, more firmly anchored than ever in the high chairs, apparently have arrived at the conclusion that all available knowledge is concentrated in Washington.

"Theoretically, the idea of directing all operations from a central point is ideal. Unfortunately, the human element enters extensively into the administration of any measure. While it is true that a few singularly gifted individuals can function satisfactorily in almost any supervisory or administrative position, still the fact remains that nearly all the chambers are filled with men of five-eighths or lesser caliber, smooth and slick and as polite as the Earl of Chesterfield, but a positive hindrance instead of a help in getting out the work.

"Take the typical case of the manufacture of blasting equipment for cleaning metal surfaces. He wanted some materials and was notified to fill out a priority application with more items on it than there are on an income tax blank. The fellow who invented that term must have had his tongue in his cheek. Blank indeed! Our hero went over the thing very carefully and stuck in an answer at every gap including the time and place of birth, if any, what ship he came over in, whether or not his grandfather chewed tobacco, please give brand, battle axe, polar bear, red man etc., how many machines were built last year, were they paid for in cash, farm produce or doubtful promissory notes. Who owned the business, he or the bank, what was the amount of his income tax last year, was it paid or just promised.

"After waiting a reasonable time without result of any kind the man went to Washington, where he was given the politest kind of a run around and tossed nimbly from one department to another. Years of experience on the manufacturing firing line furnished a protective coating. He finally found the expert who had taken his order and in his wisdom had decided this man could not have any material. The reason: 'The machines were not necessary for defense purposes.' Persistent questioning disclosed the fact that this government official clothed with full discretionary powers knew nothing of blast cleaning and thought the item referred to the little devices employed by quarrymen for setting off a blast!

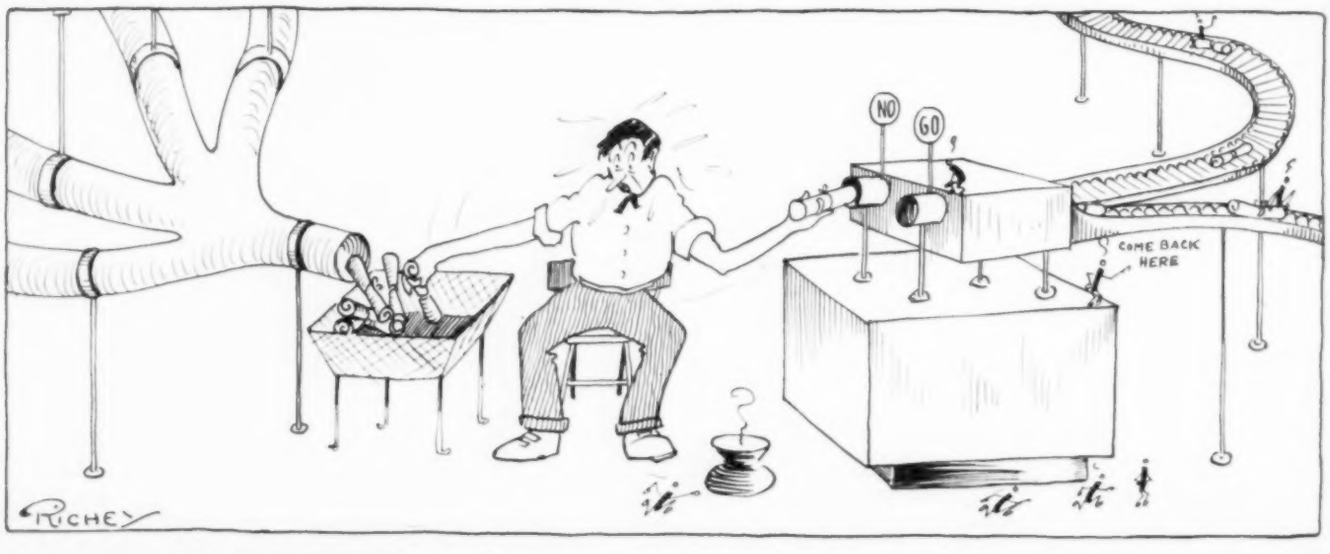
"I wish," said Bill, "that I knew the answer. The obvious answer is to let foundrymen handle their own affairs, but the trouble is that foundrymen have displayed remarkably poor judgment in selecting parents, parents-in-law or old college chums. I think the job is one that would have bothered even one of the major Prophets. I think I shall stick to some of the jobs that might have been included under the minor prophet classification.

"For instance, I had an inquiry the other day from a man who wanted to know the best way, and why is it the best way, for gating the three following castings: A plain flat plate 12 x 24 inches, 1-inch thick; a ring 4 inches in cross-section, 5 feet 4 inches inside diameter, 6 feet outside diameter; a box-type casting open on one side, 3 x 3 x 3 feet, metal thickness 1 inch.

"There is no best way for gating the plain flat plate. Practically any type of gate will fill the mold satisfactorily. The usual way is to provide two branch gates at the end or the side connected to a single sprue. One branch would serve satisfactorily so far as filling the mold is concerned, but the two branches will cover the bottom of the mold more rapidly than a single gate. The main reason for the two gates is that each one is smaller in cross-section than a single large gate. Therefore, they can be broken more readily from the casting and the stumps involve practically no chipping or grinding. Amount of clear space at the end or side of the flask decides the position of the gates. Provided the casting is to be machined the best and simplest method of gating the 6-foot ring is to make the mold in open sand, that is without a cope. A runner basin may be built at one side with the outlets about 12 inches apart to direct the stream in opposite directions. Alternatively the runner basin may be omitted and the metal poured directly into the open mold at any point. The metal is poured rapidly until the mold is almost filled. Then it is touched up gently a few times. Advantages of this method is if any scum or foreign material develops on the surface it can be removed with a skimmer while the metal is still liquid. Also if any of this foreign material shows a tendency to stick to the face of the mold it may be detached and kept floating.

"The mold is filled slightly above the specified height and the surplus metal later is removed in lathe or boring mill. Where the ring for any reason is poured under a cope, it is advisable to use two ladles diametrically opposite each other. Most of the metal is poured

(*Concluded on page* 150)



Clerk No. 117,543 PXQ sorts all applications by shoving them through a GO or NO GO gage

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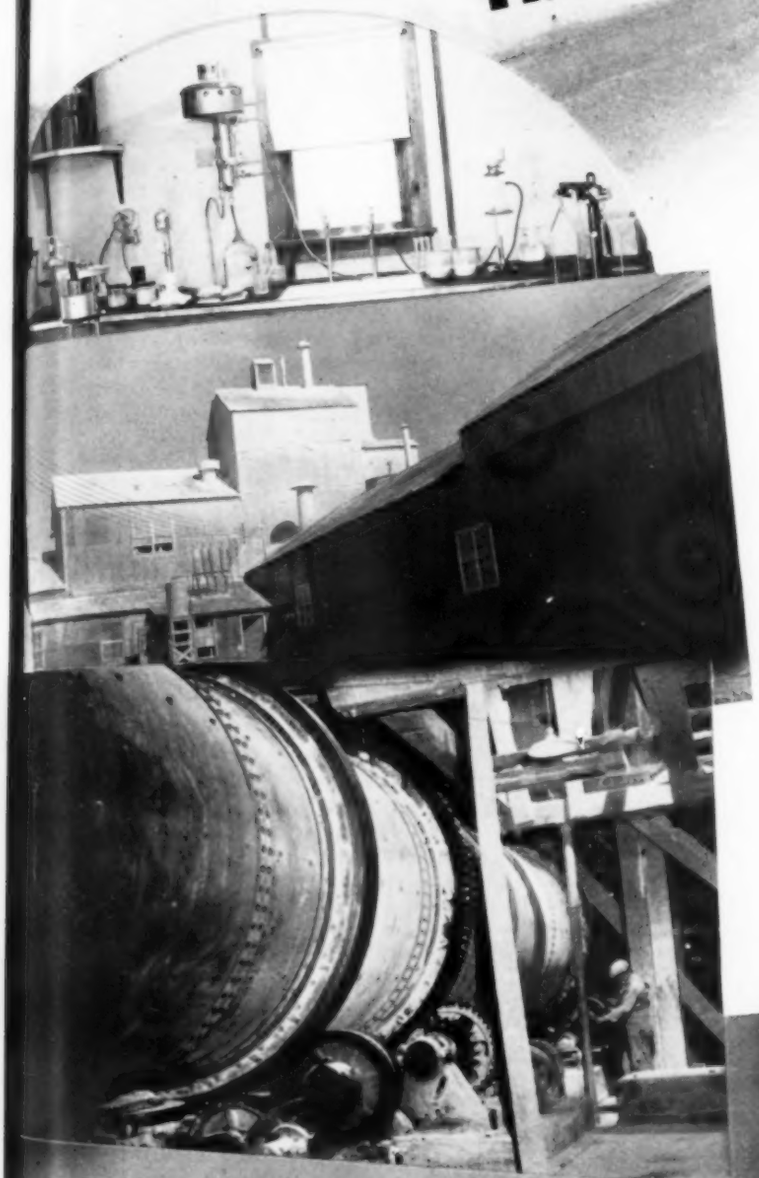

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By A. H. ALLEN
Detroit Editor, The Foundry

AMONG DETROIT FOUNDRIES

LOWLY scrap is king these days in foundry operations and as the pinch in supply grows tighter and tighter the problem of continuing casting operations at a high level becomes increasingly more complex. Inflow of scrap iron and steel to melters normally is governed by the old law of supply and demand—as demand increases prices increase so that scrap from a wider radius is magnetized to consuming points. But this pattern has been disturbed by imposition of ceiling prices on scrap at all important centers, with the result that the normal flow of material has been seriously dislocated and any incentive for collection of remote material dissipated.

Detroit is a large producing scrap district and in normal times ample material is available to supply both steel mills and foundries in this area. With the posting of price ceilings, however, more and more scrap is being moved to consuming points out of the state which have price advantages over Detroit. The result has been a drastic curtailment in the amount of Detroit scrap staying in the district for melting.

On top of this local mills such as Rotary Electric Steel Co. and Great Lakes Steel Corp., with large scrap appetites, have been operating steadily for more than a year at virtual capacity, leaving no opportunity for any building up of scrap inventories. Hence it was not too surprising that last month Great Lakes Steel came close to being forced to take off four of its 16 open hearths. At the last minute this was avoided, but scrap consumption is continuing at a rate about three times the intake of material.

Other foundries in this district have found no solution to the scrap supply problem, particularly those which do not have a source of scrap in their own plant other than return gates, sprues, risers, etc. Much of the material which could be purchased has proved inferior in quality as a result of the natural tendency to upgrade—that is to pay the ceiling price on one grade of scrap and accept shipment of a grade not quite up to that paid for.

Over at Muskegon, Mich., the Campbell, Wyant & Cannon Foundry Co. has been preparing to set up a new plant to produce steel for castings required in the defense program to the tune of something like 350 tons a day. Melting setup proposed was identical with that planned for the new Ford foundry; a combination of cupola, bessemer and electric furnaces. Equipment specifications had been drawn up and the entire program was about set for release. However, it was based on the availability of a large tonnage of low-phosphorus steel scrap which, laid down at Muskegon, was going to cost something like $27 a ton.

Pontiac Motor division will make 70,000 of its 200,000-ton schedule for the year from its own scrap. This view shows the loading of a charging bucket with briquets made from iron and steel borings and chips, rejected castings and other raw materials from pig iron and baled scrap bins

Change Foundry Program

On top of this comparatively high cost came the increasing scarcity of suitable scrap, so it appeared that some changes would have to be made in the program for the new foundry. According to word around Detroit, the latest plan calls for erection of a blast furnace at Muskegon of about 500 tons a day capacity. Hot metal from the furnace would be transferred over a company railroad to the site of the new foundry—a building formerly owned by Shaw-Box crane interests. This metal will be charged into bessemers and the carbon blown down to around 0.10 per cent, after which it will be transferred to electric furnaces for refining.

A blast furnace circumvents the bottleneck in scrap but takes a long time to build, probably six to eight months. However, the plan apparently is going ahead, the furnace to be operated by Hickman, Williams & Co., although funds would be fur-

(*Concluded on page* 83)

(*Concluded from page* 80)

nished by C-W-C, probably through government aid. This would mean abandonment of the cupola phase of the triplex melting, and would throw the burden of raw material from scrap yards onto ore mines.

Dock facilities are available at the site purchased for the furnace, now being used by a paper mill to unload lumber supplies. There is even some talk of a coke oven installation going in at the same site, in conjunction with the blast furnace.

The raw material edge boasted by foundries operated by the motor companies is shown in figures from the Pontiac foundry which show that out of 200,000 tons of iron poured there during the 1941 model season about 70,000 tons or 32 per cent was salvaged from the various manufacturing divisions of the plant.

Forty tons of sheet steel clippings daily are supplied from the sheet metal plant, and additional quantities are received from nearby Fisher Body plants. Another 40 tons of steel chips and turnings is collected by conveyors from machines of the motor plant and axle plant, deoiled in centrifuges, then crushed and briquetted for the foundry. From the motor plant comes another 40 tons of iron borings, also briquetted. Adjoining the foundry is an outdoor tumbling mill which cleans sand from gates, risers, fins, spillage and other ferrous waste so that it may be reused in foundry cupolas.

Ford's magnesium foundry is gradually stepping up its operations and at the middle of last month was averaging about 5500 pounds of castings a day, with 231 different pieces being cast.

URGES ITEMIZING PIG IRON IN REPORT

By BEN K. PRICE
New York Editor

PIG iron consumers, sellers declare, would be well advised to break down their totals, in making out future PD-70 forms on inventories to the government. Many, it appears, have not been doing so and consequently have made it difficult for OPM in making allocations which might best suit their needs, and in giving the maximum amount which might be spared.

For instance, some consumers have stocks on hand of certain special grades for mixture purposes. These stocks may not be particularly large, but often are far larger than can be consumed during the course of a month and as a result the consumers who do not itemize these special stocks are penalized on standard iron when allocations are made.

Recently some consumers finding themselves in this situation have taken up the question with OPM and as a result their suppliers have been advised to ship them more iron than their original quotas called for —by way of adjustment.

In some instances the amount of special irons on hand might not be large enough to make it appear worthwhile to itemize, but in others, and especially where allocations of standard irons have been on the sparse side, the extra amounts to be thus obtained may prove important indeed.

As a matter of fact, regardless of the extent of such stocks, it is considered wise to make them known to the OPM because there might be a grade of iron available which the consumer could use by mixing in his special irons, and which the OPM might allocate if it knew he was in position to use it.

Of course, as time goes on surplus stocks of special irons will disappear —in fact, from present indications, rapidly. Certain of these special irons at least, notably charcoal and silvery irons are not subject to allocation under the OPM ruling; however, demand is fast exceeding supply.

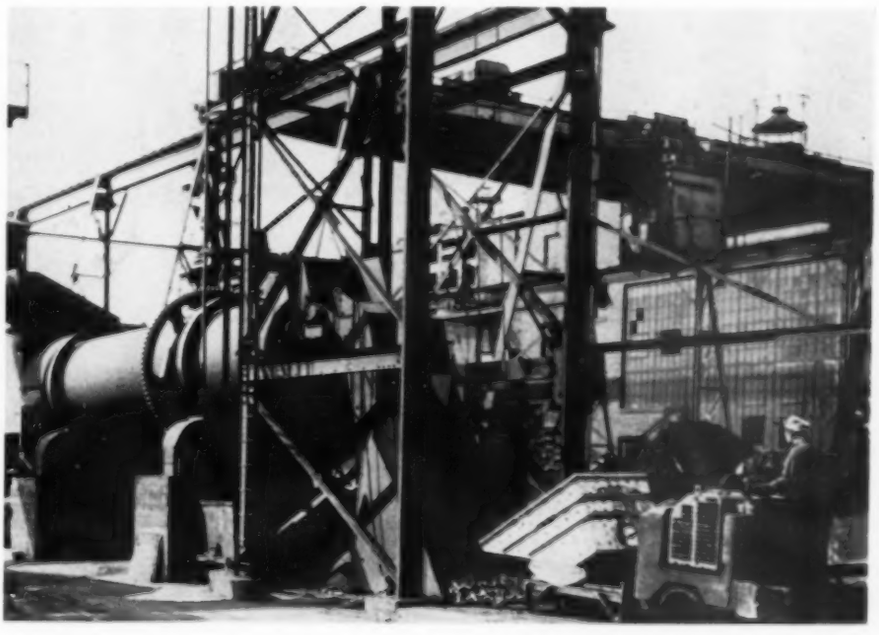
Incidentally, demand for these mixture irons not only reflects expanding melt in steel mills and foundries, but the necessity in many cases of utilizing such standard irons as may be available (this bearing on a point raised above), even though normally they would not be considered.

For instance, one eastern cast pipe maker, unable to secure an adequate amount of foundry iron recently, was forced to use basic, and to adapt this grade to his purpose had to use some silvery iron to bring up the silicon content.

Increasing satisfaction with the efforts of OPM in endeavoring to distribute iron in a just and reasonable manner is expressed in the trade. Various points which gave rise to question at first are now being ironed out and still further refinements in procedure are expected.

To Receive Award

Dow Chemical Co., Midland, Mich., is to receive the 1941 award made by the magazine, *Chemical and Metallurgical Engineering*, New York, for chemical engineering achievement based on its pioneering research in the recovery of metallic magnesium from sea water, according to Col. Alfred H. White, head of the department of chemical and metallurgical engineering, University of Michigan. The award is made to that company, which in the opinion of the committee of awards, of which Col. White is chairman, has "contributed the most meritorious advances to the industry and profession," since December 1939.



New tumbling mill adjacent to Pontiac Foundry which separates sand from gates, risers, fins, spillage and other ferrous-bearing wastes

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Activities of FOUNDRY GROUPS

New England

ANNUAL outing of the New England Foundrymen's Association, held at the Pawtucket Golf Club, Pawtucket, R. I., on Sept. 20, was attended by 70 members and guests who gathered to enjoy a day of rest and recreation. The day was exceptionally fine and many took advantage of the opportunity to play golf as well as other sports. The baseball game under direction of Walter Saunders, Walter Saunders & Co., Providence, R. I., kept many of the foundrymen busy during the period between luncheon and dinner. In addition to the orchestra that played at both luncheon and dinner, a fine entertainment concluded the festivities. Congratulations were extended to the committee which included: C. E. Andres, Whitehead Bros Co., William G. Rich, Providence Gas Co., and A. W. Calder, New England Butt Co.—*M. A. Hosmer.*

Metropolitan

PRIORITIES, metal shortages and government alloys prominent in the defense program were subjects of discussion at the opening meeting of the Metropolitan Chapter held Oct. 6, at the Essex House, Newark, N. J. E. W. Horlebein, president, Gibson & Kirk Co., Baltimore, the speaker of the evening, addressed a group of approximately 60 members and guests. Sam Tour, Lucius Pitkin, Inc., New York, served as technical chairman.

As an introduction to his talk, Mr. Horlebein recounted the steps taken by the government in reaching the present status of the priorities system. He counseled the attending foundrymen to take their priority problems to the local priority offices set up in Federal Reserve banks in preference to making a trip to Washington with each and every problem. Commenting on the possibility that priorities will be replaced by outright allocation of metals, Mr. Horlebein prophesied that the taking of inventories of stocks on hand would soon become a monthly requirement.

Getting down to actual foundry problems the speaker told of his success in using bakelite bonded

(*Continued on page* 87)

Golf, baseball and other sports were enjoyed thoroughly by those attending the annual outing of the New England Foundrymen's Association held on Sept. 20. Photos courtesy of C. A. Wyatt, Debevoise-Anderson Co., Boston

(*Continued from page* 84)
plywood in place of aluminum in making matchplates. This fabricated board has proved its worth both from a service and economic standpoint. Casting finish was a problem in his shop when an attempt was made to pour eight or ten different nonferrous alloys daily using only one molding sand. The answer to this difficulty was the use of different facing sands prepared by a sand muller. Mr. Horlebein emphasized the importance of pouring temperature control in obtaining specified physical properties. Metal temperature can be judged by the length of time the charge is in the furnace although it is advantageous to determine the actual temperature by an immersion pyrometer. The practice of preheating ladles in an inverted position was described as being more efficient than the usual method of preheating and eliminates the danger of impregnating the ladle with oil which usually leads to scrapping the first metal which is poured into the ladle.

The talk was concluded with a discussion of alloys being cast for the government in the speaker's shop, including manganese bronze, modified gun metal and monel metal. In the discussion which followed, Mr. Horlebein described various methods of molding castings and test bars. The question of inspection of government castings was of interest to the group and the speaker's comments on this subject were well received.

Max Kuniansky, general manager, Lynchburg Foundry Co., Lynchburg, Va., was announced as the speaker for the next meeting of the chapter to be held Monday, Nov. 3. His subject will be, "Scrap Metals for Making High Quality Castings in the Cupola".—*K. A. De Longe, secretary.*

Western Mich.

FALL activities of the Western Michigan Chapter started off with a slam bang stag outing at Spring Lake Country Club, Sept. 6, under the leadership of Don Seyferth, West Michigan Steel Foundry Co., Muskegon, Mich., and chairman of the chapter.

Program chairman, A. E. Jacobson and his assisting committee composed of J. W. Livingston, Paul Lane, J. L. Brooks, O. G. Jentsch, C. P. Ziegler, Rudolph Flora, H. BeMent, Charles Locke and R. Teach had an interesting and well arranged program for the day. Golf started at 8:30 a.m. with about 75 participating in the contest. At 1 p.m. other activities including baseball, horseshoes and turtle races amused the many guests. Also speed boat rides on beautiful Spring Lake were available for everyone wishing the lovely trip. Immediately before dinner there was an exhibition of gymnastic stunts under the direction of the Muskegon Y. M. C. A. At 6:30 p.m. a tasty smorgasbord was enjoyed by about 225 foundrymen and friends. Dinner music was furnished by the Famous Barber Shop Quartet and by Harold Mulder, accordionist.

Following the dinner many and varied prizes were presented to the winners of the numerous contests. This event concluded the planned part of the program. However, it was many hours later before the last mold was poured, the bottom dropped, lights out and the weary

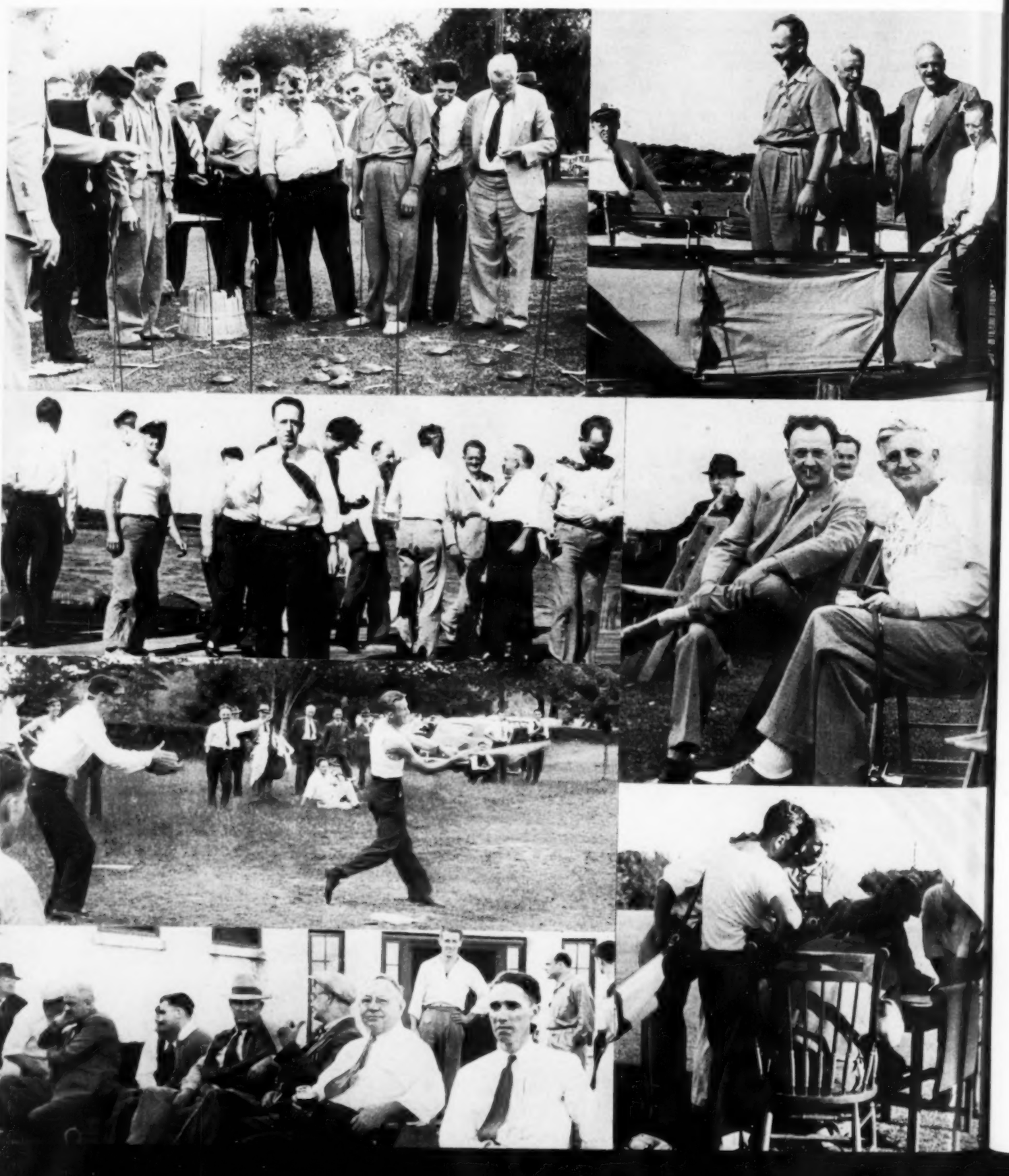
Approximately 70 members and guests attended the annual outing of the New England Foundrymen's Association held Sept. 20 at the Pawtucket Golf Club, Pawtucket, R. I. Photos courtesy of C. A. Wyatt, Debevoise-Anderson Co., Boston

foundrymen reluctantly departed.

The regular monthly meetings of the Western Michigan Chapter began on Oct. 6 at the Occidental Hotel, Muskegon. After a well attended dinner, a sound movie was shown describing operations of the Illinois Clay Products Co. Following the movie, D. F. Seyferth, West Michigan Steel Foundry Co., and chapter chairman, read a telegram from C. E. Westover, executive vice president of the A. F. A. wishing the chapter success for the coming year. He then turned the meeting over to chairman of the program committee, A. E. Jacobson, Grand Haven Brass Co., who in turn introduced the speaker, R. G. McElwee, Vanadium Corp., of America, Detroit. Mr. McElwee gave a very interesting and enlightening talk on the subject, "Making the Most of Available Materials" which seemed extremely appropriate at the present time, as indicated by

(*Continued on page* 90)

Western Michigan Chapter opened its fall activities with an outing at Spring Lake Country club on Sept. 6. Photos courtesy of D. F. Seyferth, West Michigan Steel Foundry; K. McCrady, Muskegon Piston Ring Co., and W. Johnson, Campbell, Wyant & Cannon Foundry Co.



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(*Continued from page* 88)
the many questions asked the speaker on conclusion of his talk. Mr. Jacobson announced that the next meeting would be held Nov. 3 at the Occidental Hotel with a colored motion picture, "Sand," as a feature attraction. The remainder of the program will be announced later.—*Max A. Amos, secretary-treasurer.*

New Jersey

PRINCIPAL speaker at the opening meeting of the New Jersey Foundrymen's Association was W. W. Rose, executive vice president, Gray Iron Founders Society, Cleveland. He urged all foundrymen to comply closely to all priority regulations and to make a special effort to keep their records 100 per cent accurate. A reputation for compliance in those matters at present is worth a great deal to any foundry. Mr. Rose also urged that all foundrymen obtain affidavits from customers as to the extent and character of their defense work. That, he indicated, might save them from considerable embarrassment later and might in various instances stand them in good stead in obtaining necessary raw materials. Mr. Rose said foundrymen were experiencing more difficulty in obtaining scrap than pig iron. He also expressed concern over the possibility that there would not be sufficient aluminum available for use in patterns. However, measures are being taken which it is hoped will insure an adequate amount.

Approximately 80 attended the meeting. Announcement was made of the election of the following directors: C. L. Cheasley, Thatcher Furnace Co., Garwood, N. J.; H. L. Edinger, Barnett Foundry & Machine Co., Irvington, N. J.; L. C. Ricketts, Worthington Pump & Machinery Corp., Harrison, N. J.; A. J. Spence, James Spence Iron Foundry Inc., Jersey City, N. J.; A. G. White, White Foundry Co. Inc., Jersey City, N. J.; and J. A. Williamson, Newark. New officers will be named within a month.

John L. Carter, secretary of the association, said that the organization was taking every precaution against the possibility of a temporary curtailment in operations at member plants due to lack of defense work, and was co-operating closely with Col. J. D. Sears, head of the local division of contract dis-

(*Continued on page* 92)

Approximately 225 members and guests attended the opening fall activity of the Western Michigan Chapter, an outing held on Sept. 8. Program Chairman A. E. Jacobson, Grand Haven Brass Foundry, Grand Haven, Mich., is shown at the upper right. Photos courtesy of D. F. Seyferth, West Michigan Steel Foundry; K. McCrady, Muskegon Piston Ring Co., and W. Johnson, Campbell, Wyant & Cannon Foundry Co.

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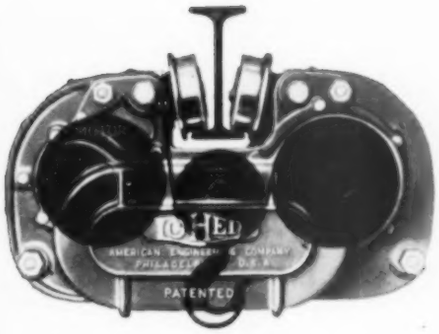

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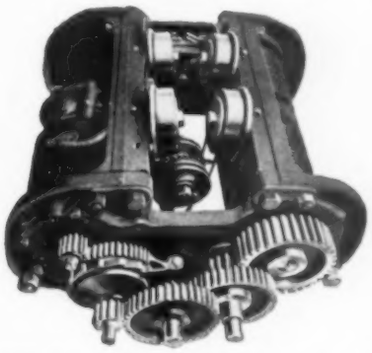

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(*Continued from page* 90)

tribution of OPM. He also said that the vocational schools have been instructed to set up a pre-employment training course, covering possibly eight or ten weeks, for foundry apprentices. The association has been asked to co-operate.—*B. K. Price.*

Chesapeake

THE Chesapeake Chapter opened its 1941-42 season on Friday, Sept. 26, at the Engineer's Club, Baltimore. Fifty members were present for dinner and 75 members and guests were present for the meeting.

Immediately after dinner, E. W. Horlebein, chapter chairman, introduced Frank G. Steinebach, editor of THE FOUNDRY, who explained a number of details of the recently issued preference rating order P-22 as regards foundries, their customers, and suppliers.

The chapter was pleased to receive a telegram from C. E. Westover, executive vice president of the American Foundrymen's Association, which extended best wishes for successful meetings throughout the coming season.

Max Kuniansky, Lynchburg Foundry Co., Lynchburg, Va., was presented to the chapter as the speaker of the evening. Mr. Kuniansky talked about the use of scrap in the present emergency which proved to be an interesting and timely subject. He pointed out that due to a shortage of pig iron and scrap steel his company is using stove plate and automotive scrap. By careful manipulation they are getting results. He also mentioned that they were installing a briquetting machine for using borings and which they hope will give them another source of supply for scrap materials.

Friday, Dec. 5, has been set as the date for the chapter's annual smoker and get together to be held at the Lord Baltimore hotel.—*Frederick Bruggman.*

Ontario

OPENING meeting for the 1941-42 season, Ontario Chapter, was held at the Royal Connaught Hotel, Hamilton, Friday, Sept. 26, with approximately 90 foundrymen present, and N. B. Clarke, Steel Co. of Canada, and chairman of the chapter, presiding. The principal speaker was A. W. Gregg, foundry engineer, Whiting Corp., Harvey, Ill. Mr. Gregg pointed out that cupola construction has been a matter of discussion since the earliest days of the foundry business, but while there are yet divergent opinions, there is better agreement today than at earlier periods. The committee on cupola research, established by the American Foundrymen's Association, hopes in due course to issue an authoritative and comprehensive book on "Cupola Practice and Design."

Details to be considered in starting up the cupola include repair of refractories and the placing of a suitable sand bottom for which specifications preferably should be set up by the sand laboratory. In starting the cupola, coke should be added to 80 per cent of the proper height and the cupola burned in under natural draft, taking 2 or 3 hours in order to dry slowly and heat up gradually. Then by adding coke to the right height, and turning on the wind, hot iron may be secured at the start of the operation, a procedure which is cheaper than pigging some of the first iron poured. It is bad practice to try to squeeze the last drop of molten metal out of the cupola, as the last half hour of operation can do more damage to the lining than the rest of the run. Shutting down of the cupola is undesirable but can be done when necessary. Air weight control is becoming very popular in cupola operations since under this system adjustments are automatically made to deliver a uniform amount of oxygen under all atmospheric conditions. Mechanical charging has made progress because of labor savings, greater safety and its contribution to even cupola operation.

In discussing steel converters, Mr. Gregg pointed out that the use of electric eye control on side blow converters had resulted in remarkable improvement in its operation, with the result that a good many converters have been installed in steel foundries recently. With electric eye control it is possible to get the end point of the blow accurately, within a fraction of a second. Under normal operating conditions the side blow converter does not offer much lower conversion costs than the electric furnace, but it does offer means for elimination of the serious demand factor associated with electric furnaces in times of slack operation. The rapid cycle of the converter has made it possible to secure a more continuous supply of hot steel and in combination with an electrically heated ladle that problem is completely and satisfactorily solved.

T. H. Scott, field representative, Dominion-Provincial War Emergency Training program, offered the co-operation of his organization with the foundry industry in the training of men for the foundry. Any course of this type would be set up under advice from the foundry industry on the exact nature of the training most suited to its needs. Reference was made to the program already undertaken by the Canadian Founders' and Metal Trades' Association which has some 30 men in training in the Toronto area. It was decided that some co-operative plan between the Canadian

(*Continued on page* 95)

A few candid snaps of members and guests who attended the Sept. 26 meeting of the Chesapeake Chapter meeting. Photos courtesy of Frederick Bruggman, Gibson & Kirk Co., Baltimore

(*Continued from page* 92)

Founders' and Metal Trades' Association and the American Foundrymen's Association with the possible assistance of the Dominion-Provincial War Emergency Training program should be discussed.—*G. L. White, secretary-treasurer.*

Connecticut

SEPTEMBER meeting of the Connecticut Foundrymen's Association was held at the Home Club, Meriden, Conn. Robert C. Mills, superintendent, Manufacturers Foundry Co., Waterbury, Conn., and president of the association gave a brief talk outlining the endeavors of the organization to present a diversified program for the ensuing year.

The meeting was then turned over to several speakers, the first Franklin Farrel III, foundry superintendent of the Farrel-Birmingham Co., Ansonia, Conn., who gave an interesting talk on priorities, with particular regard to the scarcity of raw materials and manufactured miscellaneous equipment. He stressed that the attitude of the OPM was one of extreme cooperation. Several questions followed Mr. Farrel's interesting talk, and then W. J. Maton of the Waterbury Farrel Foundry & Machine Co. gave a brief talk comparing conditions of raw materials during 1916-1918 with the present time. Donald Sawtelle, Malleable Iron Fittings Co., Branford, Conn., then described the Malleable Iron Fittings Co. foundry which is using the duplex system with cupola and air furnaces, and a completely mechanized shop.—*Henry C. Griggs, secretary.*

Wisconsin

WISCONSIN Chapter started off the 1941-42 season on Sept. 26, with the largest attendance at a regular monthly meeting that has ever been recorded by the group, 231 foundrymen. Prior to the group meetings, the entire chapter had the pleasure of seeing a new sound movie on manufacture of fire clay and fire brick through the courtesy of the A. P. Green Fire Brick Co.

The groups divided up as follows:

Gray iron group, Frank Kulka, general superintendent, Motor Castings Co., chairman, reported the subject discussed was "Design of Patterns and Its Effect in Foundries." The question was well prepared and presented by H. Pfeiffer, Allis-Chalmers Mfg. Co., and A. Fischer, Jurack Pattern Co. Following discussions verified the interest of members in the vital question of patterns and included: Reason for use of metal patterns on air-cooled cylinders; correlation of blueprint reading by the foundryman and design of patterns affecting final castings result; use by the patternmaker of models before patterns are made

Activities of the Pittsburgh Foundrymen's Association opened with the annual fall outing held at Daniel's Farm in September. Photos by R. L. Hartford

in explaining method and reason for splitting core boxes and patterns to practical foundrymen; study of changing apprentice schedules so foundry or core apprentices are placed in pattern shops and vice versa.

Stephen Pohl, Federal Malleable Co., was chairman of the malleable group. The Milwaukee Malleable Club conducted a scrap clinic in conjunction with the Wisconsin Chapter meeting. Frank L. Harris, Belle City Malleable Iron Co., conducted the clinic. Sample castings which have caused production difficulties in the foundries represented were examined and discussed by the various members present. Casting defects caused by furnace conditions, melting practice, atmospheric changes and types of charges were discussed at great length. Thirty-eight members were present.

Steel group was headed by Fred Pritzlaff, foundry superintendent, The Falk Corp. Subject of that discussion was, "Electric Furnace Melting" under the leadership of John Cannon, chief melter, Milwaukee Steel Foundry division, Grede Foundries.

Nonferrous group had as its chairman Walter Edens, metallurgist, Ampco Metal Inc. That group started off the year with an attendance of 43. The discussion was led by W. K. Wallace, Foundry Materials Inc., who spoke on "Nonferrous Foundry Sands." The speaker dwelt at some length on the geology of foundry sands, showing the types and locations of our various sand producing areas. Considerable emphasis was placed on the desirability of having the proper structure, but more particularly, the proper grain distribution in order to develop maximum properties. There was considerable discussion originating from the group as a whole on sands for particular purposes. The discussion also covered comparison of synthetic versus natural bonded sands, as well as the use of bonding clays as a means of maintaining strength in natural sands.—*G. K. Dreher, secretary.*

N. E. Ohio

SECOND regular monthly meeting of the Northeastern Ohio Chapter held on Oct. 9 was one of the largest ever held with approximately 200 members and guests present. Frank J. Dost, president, presided and an innovation for the chapter was an accordionist who played before and through the dinner. Jack Lathrop, secretary, called attention to the Purdue Conference meeting and urged as many as possible to attend. L. P. Robinson, national director, spoke briefly to the assembled apprentices who were guests of the chapter, conveying greetings from national headquarters, and congratulated the winners in the national and local contests.

Frank Cech, chairman of the chapter's apprentice committee, presented bronze placques awarded by the chapter to the foundries whose apprentices won recognition in the local apprentice contest. First prize in gray iron went to Bowler Foundry Co.'s Chester Blacksmith, and was accepted by William Goebert; second prize awarded to Westinghouse Electric's William Wehagan, and accepted by Fred Pascoe; third prize to Hill-Acme's Mike Slivka and accepted by George McNabb.

Left to right, A. S. Nichols, Illinois Clay Products Co., and Milton Carpenter, Carpenter Bros. Inc., at the Sept. 26 meeting of the Wisconsin Chapter. Photo courtesy of John Bing, A. P. Green Fire Brick Co., Milwaukee

First and second prizes in steel molding were awarded to Crucible Steel's Bob Bina and Robert Miller, and accepted by Bruce Aitken; third prize went to West Steel Casting's Peter Opacich, and accepted by D. P. Lansdowne. First prize in nonferrous molding was given to Wellman Bronze's John Jasso, and accepted by H. G. Wellman. First prize in patternmaking was presented to Western Pattern's Albert Jazbinski, and accepted by Walter Seebeck; second prize went to Master Pattern's John Burczsky, and was accepted by Vincent Sedlon, and the third prize was awarded to Hill-Acme's Walter Zernechel, and accepted by Harry Zernechel, his father.

Principal address of the evening was presented by Max Kuniansky, general manager, Lynchburg Foundry Co., Lynchburg, Va., who discussed "Use of Scrap in the Present Emergency". At the beginning of his talk the speaker pointed out that he would confine his remarks to his own firm which operated four foundries producing a wide variety of castings ranging from plow parts and centrifugally cast pipe to chemical and machine tool castings weighing up to 40 tons. He also pointed out that the practice employed probably would not be directly applicable to another shop, but the procedure could be adapted after careful study of all factors.

Mr. Kuniansky said that one of the first things to remember in use of scrap is that no one as yet has succeeded in putting nothing in the cupola and getting something out no matter how much coke was used, stating that the nothing referred to burnt grate bars and similar materials. Also he said that foundrymen in general were too hidebound in their actions preferring to follow tradition relative to raw materials and other practices used, rather than being willing to try something different. However, with the present scarcity of pig iron, and other regular cupola scrap materials due to a variety of causes, the foundryman of necessity must make the best of available materials—materials he would not have considered a few months previously.

He pointed out that good results with available cupola materials only result from constant, vigilant control—intelligently applied. Ideas and practice must be changed, and much more work is required to accomplish good results. Mr. Kuniansky described one procedure employed by his firm to secure a suitable uniform product for remelting in the cupola. It is melting miscellaneous light steel scrap in a cupola and pouring it into 6-inch square pigs. Coke to iron ratio is about 1 to 8, and the blast is low. The material is low in silicon and phosphorus, and is remelted with other scrap, etc., before pouring into castings.

Mr. Kuniansky stated that his experience indicated that there was no essential difference between the results obtained with steel rail scrap and with light scrap such as automobile rims when proper precautions were taken such as using a low blast for light material and a heavy blast for thicker material, etc. It is necessary that iron be melted hot, but it may be poured cool, depending of course on section thickness. He said that he believed that a receiving ladle was essential to insure uniformity in the cupola iron, particularly under today's conditions.

The speaker stated that he had found the use of ladle additions quite efficacious in obtaining a quality product, and gave as his opinion that zirconium-silicon was the most powerful scavenger. Other materials that gave good results included late silicon additions, calcium silicide, and numerous proprie-

(*Continued on page 98*)

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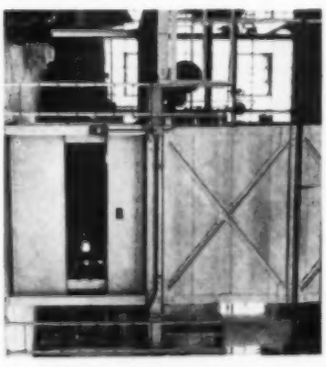
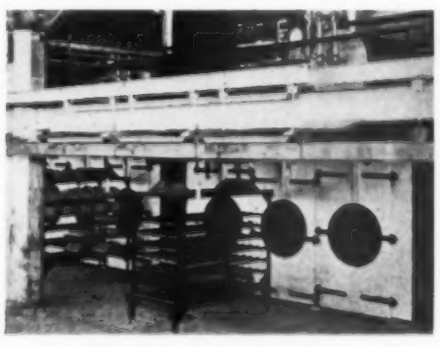


Carl-Mayer Vertical Conveyor Type Core Oven



Part of large Carl-Mayer Recirculating Gas Fired Rack Type Oven installation at The General Electric Co.

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(*Continued from page* 96)

tary alloys. To obtain the most satisfactory results from 7 to 10 minutes are allowed between making the ladle addition and pouring so as to permit full reaction.

Front slagging cupolas according to Mr. Kuniansky have many points of advantage, and desulphurization with soda ash accomplishes much more than just a reduction of sulphur, giving a much cleaner iron. In his plant 7 pounds of soda ash are used per ton in the teapot ladle, and 5½ pounds in the U-shape ladle the ladle. Melting 400 to 500 tons of iron per day, linings in the ladles last about 10 heats. Iron over the spout is about 2725 degrees, and is poured at 2400 degrees. Balanced blast cupolas are used with 4000-pound charges consisting of 3500 pounds of scrap and 500 pounds of the previously described pig. Beehive coke mixed with pitch coke is employed to produce an iron high in total carbon.—*Edwin Bremer, chairman publicity.*

Chicago

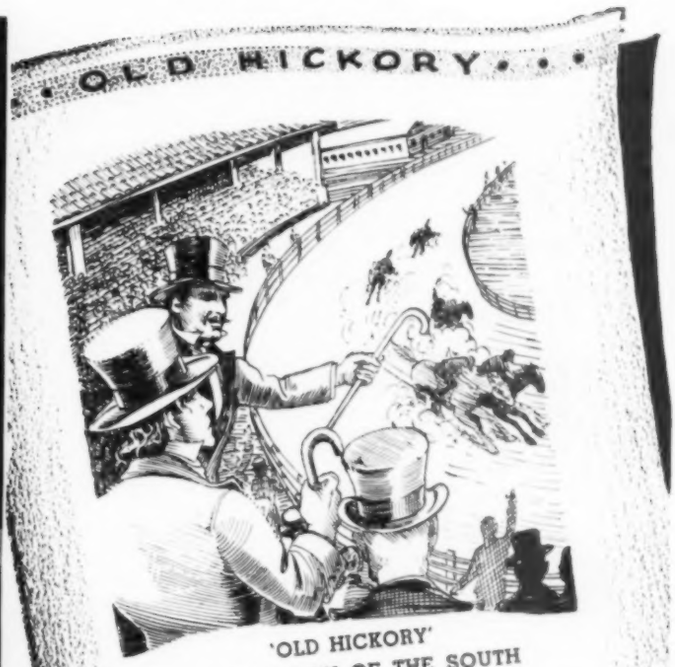
ANNUAL stag outing of the Chicago chapter A.F.A. again was held—this year under an M-17 priority arrangement—at the swanky Lincolnshire Country club, south of Chicago, Saturday, Sept. 27, and members and guests to the count of 1037—a new record—took time off from getting out national defense production to attend and participate in the day's activities.

By pre-arrangement of the committee with the proper governmental agency, a preference rating had been obtained on the weather, this resulting in delivery of an adequate supply of warmth and sunshine. Only factor not under control was the wind, which was high and gusty and spoiled many good golf games. Nevertheless, 450 played golf on the three tricky 18-hole courses. Non-golfers divided their time between

(*Continued on page* 100)

Chicago Chapter's fall outing was one of the best attended gatherings of that type arranged by the group. Photos by George A. Pope

SCALE CAR IN OPERATION



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(*Continued from page* 98)
sports show was put on, this including female boxing bouts and wrestling matches; an excellent demonstration of expert bait casting; and comedy games and races in the elevated boxing ring. Promptly at 7 p.m., a chicken dinner was served in the Big Tent, specially put up for the occasion, and nowhere evident was any shortage of either raw materials or labor in delivering these supplies. Prizes to winners in golf and other sports and to holders of lucky number tickets were awarded immediately after dinner, and here again—judging by the number and quality of prizes—no shortages in strategic materials could be detected. Balance of the evening was spent watching a smart nine-act floor show, this also booked under priorities as essential to the national defense program and demonstrating that there is no deficiency in the entertainment field.

Handling an outing crowd exceeding 1000 was no simple matter, yet handled it was almost professionally, to the credit of the outing committee and chapter officers.

J. G. Gore, Werner G. Smith Co., was chairman of the outing committee, and H. Cullen, Carnegie-Illinois Steel Corp., was secretary. Serving with them were: J. H. Abbott, Hickman, Williams & Co.; M. F. Becker, Whiting Corp.; J. H. Bemis, Pickands, Mather & Co.; W. A. Brewster, Wisconsin Steel Works; Dan Farrell, Carnegie-Illinois Steel Corp.; H. A. Forsberg, Continental Roll & Steel Foundry Co.; D. N. Gellert, Nichol Straight Foundry Co.; W. L. Hartley, Link-Belt Co.; H. F. Henninger, International Harvester Co.; H. B. Hoge, Western Foundry Co.; G. Kramer, American Manganese Steel Division; Roy A. Lindgren, Wisconsin Steel Co.; T. J. Magnuson, J. S. McCormick Co.; P. V. Martin, Carnegie-Illinois Steel Corp.; E. McGinty, Burnside Steel Foundry Co.; O. C. Olson, S. Obermayer Co.; J. H. Owen, Harbison-Walker Refractories Co.; W. H. Parker, American Steel Foundries; Irwin Peterson, McCarthy Foundry Co.; H. Pfeiffer, Electro Metallurgical Co.; Carl Thieme, H. Kramer & Co.; and Charles Wright, American Brake Shoe & Foundry Co.—*E. F. Ross.*

Central Indiana

AFTER being more or less inactive during the summer months, the Central Indiana Chapter got away to a good start for its Fall and Winter activities on Saturday, Sept. 13 with its first annual picnic at the Lake Shore Country Club. In spite of the fact that several of the foundries in the district were working on that day, about 200 members and guests were present. The weather was ideal and a good time was had by everyone. Golf, baseball, horseshoe pitching and various other games were played by most of those present. S. C. Wasson, National Malleable & Steel Castings Co., and G. A. Saas, Citizens Gas & Coke Utility, made use of their cameras, getting some good pictures of the various activities. A chicken dinner was served in the evening after which the prizes for the various events were awarded. B. P. Mulcahy, picnic chairman, and his very able committee chairman did a lot of work in preparing for the picnic, and

(*Continued on page* 103)

Over 1000 members and guests were present at the annual outing held by the Chicago Chapter on Sept. 27. Photos courtesy of T. G. Waugh, Certified Core Oil & Mfg. Co., Chicago

(*Continued from page* 100)

they are to be congratulated for the successful manner in which it was managed.—*J. P. Lentz, treasurer.*

Principal speaker at the Oct. 6 meeting of the Central Indiana Chapter held at the Washington Hotel, Indianapolis, was B. P. Mulcahy, research engineer, Citizens Gas & Coke Utility, Indianapolis, who discussed, "Cupola Operation and Raw Materials." Approximately 100 members and guests were present for the discussion, and H. B. Harvey, chairman of the chapter presided. Mr. Mulcahy outlined first the methods used in the production of foundry coke. He also covered cupola operation.

"Sand Control" will be the topic of the Nov. 3 meeting of the chapter to be held at the Washington Hotel, with Earl E. Woodliff, Harry W. Dietert Co.,. Detroit, as speaker. —*Ralph A. Thompson, secretary.*

Philadelphia

REGULAR meeting of the Philadelphia Chapter was held at the Engineers Club, Friday, Oct. 10, at which time the fiftieth anniversary of the founding of the Philadelphia Foundrymen's Association was observed. Among the guests present were several men who were active in the early days of the chapter.

The after dinner speaker, George C. Davis, consulting metallurgical chemist, spoke on, "Recollections of Men and Methods in the Past Fifty Years". Mr. Davis was one of the active members of the association during the early years of its existence, and one of its first speakers. His talk covering methods used in the foundry 50 years ago and improvements and advances since that time proved most interesting.

The principal speaker of the evening was Norman L. Mochel, metallurgical engineer, Westinghouse Electric & Mfg. Co., who spoke on "Steel Castings and Specifications." Mr. Mochel outlined the present trends in specifications of steel castings, among which are stabilization and simplicity, passing of certain superfluous tests and tendency to rationalize requirements for physical properties.

Approximately 140 were present at the meeting and Harry Reitinger, U. S. Pipe & Foundry Co., newly elected chairman presided.

November meeting of the chapter will feature a representative of the OPM who will discuss raw material supplies, particularly metals and alloys. Charles Grakelow, director of purchases for the city of Philadelphia will be the after dinner speaker. The meeting is to be held Nov. 14 at the Engineers Club.—*B. H. Bartells, chairman, publicity committee.*

N. California

ANNUAL stag outing and golf party of the Northern California Chapter was held at Sequoyah Country Club, Friday, Oct. 10, and was a wonderful success. The golfers numbered 52. Many other enjoyed themselves at horseshoes and tennis. Some played ping pong and cards and still others gathered around the swimming pool and cheered the aqua sporters. A good dinner was served to 97, after which there was group singing led by our entertainment chairman, Pete Valentine, who had provided talented assistance, also a song book for everyone.

After dinner, E. M. Welch, American Manganese Steel division and chairman of the chapter, performed his annual duty of distributing prizes to the winners of the contests. He also directed drawing of 12 cash door prizes, plus four $25 defense savings bonds. The heavy weight prize of the evening was a pig of iron presented to past chairman, Sam D. Russell, Phoenix Iron Works, Oakland, Calif., in appreciation of former service. A congratulatory letter from Chicago headquarters was read, also a Washington telegram from junior past chairman, Ivan Johnson, who has accepted appointment on Floyd Odlum's committee. The first one to win a prize set the precedent of making a voluntary contribution

On Sept. 23 Fulton Lewis, well known Washington radio commentator and newspaper man interviewed W. H. Worrilow, president, Lebanon Steel Foundry, Lebanon, Pa., and numerous employes on the production of armor castings by the firm for national defense. The interview was broadcast over the Mutual network of 135 stations and presented in co-operation with the National Association of Manufacturers. The upper illustration shows Mr. Lewis and Mr. Worrilow at the microphone with an electric furnace in the background. Lower illustration shows Mr. Worrilow, Miss Polly Ann Worrilow, and James Blouch, a molder, looking at the plant banner. Father and two uncles of James Blouch also are molders at Lebanon Steel Foundry

to the entertainment fund, and by the time it was all over, we had a goodly sum as a nucleus for future use.

As a visitor, L. L. Ventre, Mayor of Stockton, who operates the Augustine Brass Castings Co., was present with two other Stockton foundrymen. Several other outlying cities were represented as well. —*George L. Kennard, secretary treasurer.*

Twin City

FIRST fall meeting of the Twin City Chapter was held Saturday, Sept. 20, at Bayport, Minn. A luncheon meeting of the officers executive committee was held at 12:30 at the White Pine Inn. At this meeting C. E. Westover, executive vice president of the A. F. A., was present and discussed the various problems arising in the operation of a chapter. At 2 o'clock approximately 60 members and friends met at the plant of the Andersen Foundry Co., and were the guests of Mr. Andersen and Mr. Wood for a cruise on the St. Croix river. It was a delightful afternoon and everyone enjoyed the trip.

At 6 o'clock they all gathered for dinner at the White Pine Inn. Following dinner, E. C. Madson, chairman of the chapter, presided. Mr. Westover presented a gift to the chapter on behalf of the A. F. A. in accordance with the custom of recognizing the "Baby Chapter." The first speaker on the program was Earl Pitney, of the district office of OPM. He gave an interesting talk on the matter of government priorities and the various problems involved. This was followed by a number of questions which Mr. Pitney readily answered. Mr. Westover spoke next and gave an interesting talk on how to make the chapter a live, successful organization.—*O. W. Potter, secretary-treasurer.*

Detroit

FIRST meeting of the 1941-42 season was held by the Detroit chapter Oct. 16 at Fort Wayne Hotel, with about 75 in attendance. Feature of the evening was a discussion of Ford Motor Co. foundry activities, particularly in production of defense castings. E. C. Jeter and G. Vennerholm, metallurgists with Ford commented on various types of castings now being produced and a few which have been proposed for early production. Lantern slides showed other examples, while a display of actual production and experimental castings was arranged for the inspection of those in attendance.

The Detroit chapter this year has decided to inaugurate a new type of program, featuring strictly "local talent". Each month one foundry in the district will be selected and several representatives from that plant invited to discuss melting techniques, molding, coremaking, cleaning, and inspection procedures practiced at that plant. This is being done in the belief that the majority of foundrymen in the district are interested primarily in the types of work being done in their immediate vicinity and thus would be more inclined to participate actively in

programs designed around local foundries.—*A. H. Allen, secretary.*

St. Louis

A FINE attendance marked the Oct. 9 meeting of the St. Louis District Chapter. Carl Morken, Carondelet Foundry Co., St. Louis, chairman of the group expressed pleasure at the number attending.

A. H. Ricker and George Steffans, Priorities division, Office of Production Management, were presented to the group and they answered written questions submitted to them during the discussion periods and after the meeting. Quite a number of the members and guests present took advantage of the opportunity to secure answers to pertinent questions concerning operation of the priorities set up.

Lieut. Col. W. Carter Bliss, Division of Contract Distribution, St. Louis, and a past chairman of the chapter, spoke on defense, past, present and future. Mr. Bliss's excellent talk outlined the progress of the defense program to date, emphasized its extreme importance to a national welfare and outlined many features of the program in a manner that was most interesting and instructive. Certain facts as presented by Colonel Bliss brought keenly to the attention of those present the necessity of hearty cooperation in the foundry and affiliated industries.

Chapter Secretary Jack Kelin, presented a gavel to Chairman Morken, following which John Williamson, M. A. Bell Co., and chairman of the membership committee, discussed the importance of membership work during the coming year. He urged not only a numerical increase but also increase of the interest in the chapter and chapter work.—*J. W. Kelin, secretary-treasurer.*

Birmingham

SIXTH annual barbecue, first meeting of the year for the Birmingham District Chapter, was held at Pine View Beach near Birmingham on Sept. 20. Some 500 members and visitors were present to enjoy the activities, which included softball, swimming, bowling, horseshoe pitching and golf.

"Preparing and Testing Steel and Iron Foundry Sands," is the subject to be discussed by Fred B. Riggan, metallurgist, The Key Co., East St. Louis, Ill., at the chapter's Nov. 21 meeting.—*W. E. Jones, chairman of publicity.*

Quad-City

SEPTEMBER meeting of the Quad-City Chapter was held at LeClaire Hotel, Moline, Ill., Monday, Sept. 15. There were 75 present and Alex Matheson, French & Hecht Inc., vice chairman of the chapter, presided. Introduction of visitors and announcements of the Chicago Chapter outing and the Purdue University conference were made. Chris Oberlander was appointed chairman of the membership committee for the year.

Main speaker of the evening was N. J. Dunbeck, vice president, Eastern Clay Products Co., Eifort, O., who spoke on "Synthetic Sands." He gave a very clear definition as to what a synthetic sand is, why it is used in the foundry industry, and the mixtures available for various types of castings. Mixtures and types were given considerable attention in regard to their advantages and disadvantages as compared to natural sands. Mr. Dunbeck discussed what to look for in sand, as to grain size, its hardness, refractory qualities, shape and expansion. An interesting and practical discussion followed and was of great value.—*J. Morgan Johnson, secretary-treasurer.*

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S. California

A REPRESENTATIVE of the OPM, E. C. Potratz, was the principal speaker at the Sept. 25 meeting of the Southern California Chapter held at the Elks Club, Los Angeles. Approximately 80 members and guests were present and B. G. Emmet, Los Angeles Steel Casting Co., and chairman of the chapter, presided.

Mr. Potratz gave the history of the Federal Reserve bank, and then told of its activity in connection with the Office of Production Management. He discussed in brief the defense supplies rating plan and in more detail, the defense service contracts and how the Federal Reserve bank will assist small industries to become subcontractors. He gave a clear picture of the operation of the preference rating certificates and blanket preference orders, as to what materials could be purchased on extensions of these, and how to extend them.

The colored motion pictures taken at the chapter's summer stag were shown by Dick Hughes.—*W. D. Bailey Jr., secretary.*

Group Pays Tribute To Memory

Members and friends of the Birmingham District Chapter of the A.F.A., at its sixth annual barbecue, Sept. 20, temporarily suspended all celebration to pay tribute to William Oberhelman, widely known and universally loved and respected foundryman, who died June 28, 1941. Mr. Oberhelman had been connected with the Hill & Griffith Co. for many years and at the time of his death was vice president and Southern branch manager.

Lester N. Shannon, vice president, Stockham Pipe Fittings Co., past president and at present a director of the American Foundrymen's Association, and one of Mr. Oberhelman's closest friends, eulogized his life and work in the foundry industry and in activities of the A.F.A. Mr. Shannon reminded the group of several incidents in Mr. Oberhelman's life which illustrated his kindness and interest in giving advice and help to struggling foundrymen, ending with the statement: "We in the foundry industry, particularly in the South, have lost one of the best friends and most interested counselors we have ever had and whose spirit and influence we miss and are going to continue to miss for many years to come." The entire group then bowed their heads for a minute of silent prayer in Mr. Oberhelman's memory.

Arranges Foundry Practice Classes

Southern California Chapter of the A. F. A., in conjunction with the Los Angeles School board, has arranged to conduct evening classes in gray iron, nonferrous and steel foundry practice. The course includes actual molding and coremaking, also cupola and pit furnace melting practice, and is given at the Manual Arts High School foundry, Los Angeles. The foundry at the school has been enlarged considerably so that courses in steel foundry practice can be held at the same time as the other branches of the industry. The tentative schedule includes practical classes two evenings each week for each group and a lecture course on each Friday evening. Robert Gregg, Reliance Regulator Corp., Alhambra, Calif., is chairman of the apprentice committee.

Wisconsin Prepares For Conference

Fifth annual foundry conference to be sponsored by the Wisconsin Chapter in co-operation with the college of metallurgy, University of Wisconsin, will be held in the Schroeder Hotel, Milwaukee, Feb. 26 and 27.

Plans for the conference were made at a meeting Friday, Oct. 10, of the general conference committee, headed by Howard Waldron, Nordberg Mfg. Co., Milwaukee, vice president of the Wisconsin Chapter, who will serve as general chairman. Assisting him on the general committee will be T. E. Ward, secretary; R. F. Jordan, treasurer; Prof. Joseph F. Oesterle of the University of Wisconsin, John Bing, B. D. Claffey, D. I. Dobson, George Dreher, Lee Everett, A. M. Fischer, Walter Gerlinger, A. C. Haack, Carl Haertel, William Hambley, A. Higgins, Roy M. Jacobs, R. Krumbiegel, Harry E. Ladwig, R. G. Metzger, George M. Pendergast, S. Phol, F. A. Pritzlaff, L. B. Tuttle, R. C. Woodward, A. C. Ziebell and David Zuege.

The sectional chairmen will be A. C .Haack, gray iron; R. C. Woodward, steel; A. Higgins, nonferrous; D. I. Dobson, malleable. Other chairmen will be George Dreher and Harry E. Ladwig, speakers; George M. Pendergast, publicity; Roy M. Jacobs, arrangements; R. F. Jordan, registration; Walter Gerlinger, table reservations, and T. E. Ward, entertainment.—*G. M. Pendergast.*

Members and guests of Birmingham Chapter paid tribute to memory of William Oberhelman

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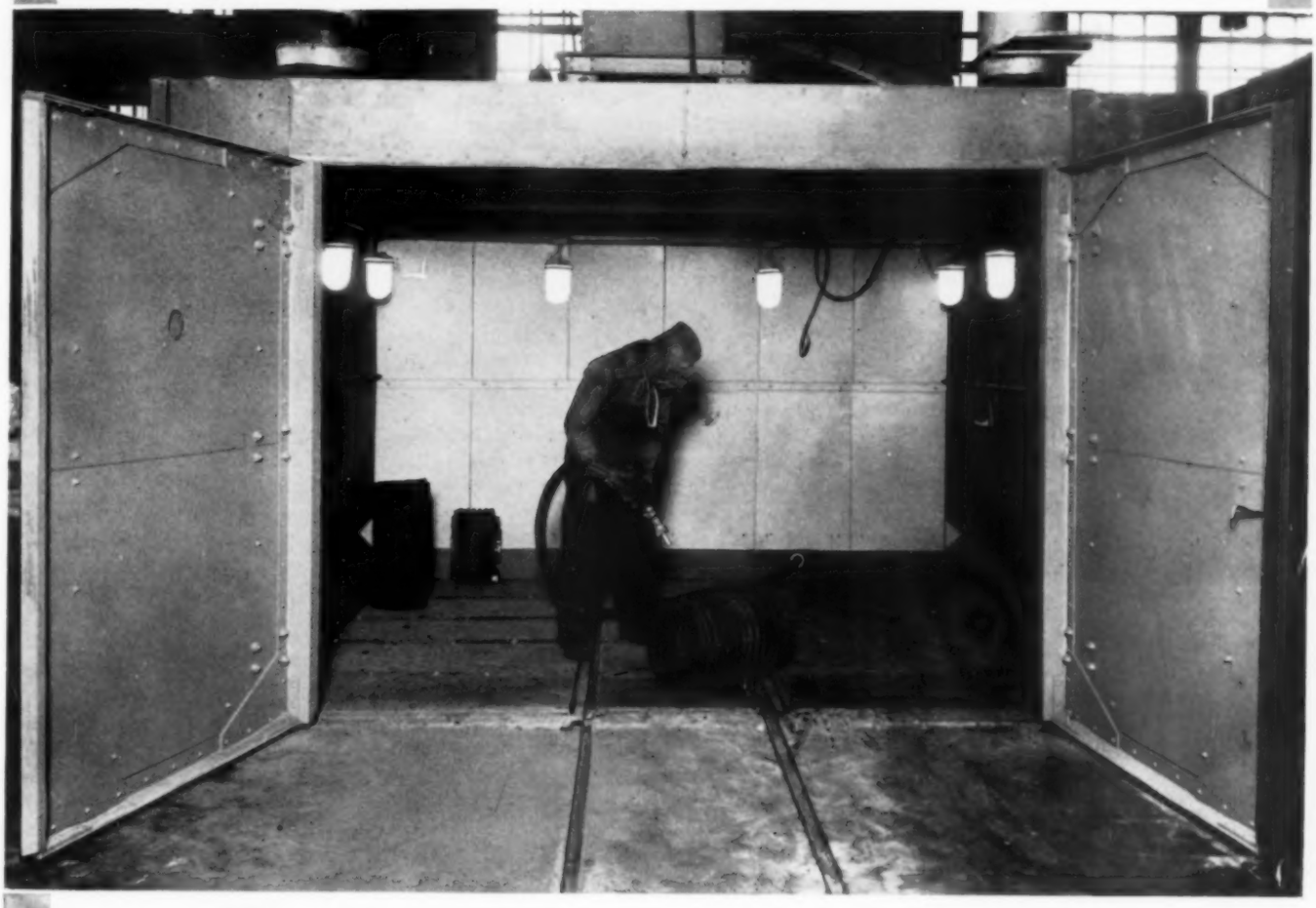

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ADVERTISING MATTER REMOVED

COMMENT

THE Priorities Division recently announced that a check on compliance of priorities orders regulations in the aluminum foundries of the country was being undertaken. The investigating was placed in the hands of Wage and Hour Division inspectors from the Department of Labor. I cannot help but wonder why the aluminum branch of the foundry industry was singled out for this crack-down; why the checkers from the Department of Labor were given this job rather than experts in the field of foundry production and management; and why the aluminum branch of the foundry industry has not been accorded a more sympathetic understanding at Washington since those early days in the defense effort when it began to be apparent that the supply of aluminum did not equal the demand.

—□—

Amendment to preference rating order P-22, announced Oct. 16, provides facilities and an A-10 priority rating for foundries to obtain needed repairs, maintenance and operating supplies. The amendment broadens the original order, and now covers, among others, any individual, partnership, association, corporation, or other form of enterprise engaged in manufacturing, processing or fabricating.

I suggest all foundries read carefully the entire amended order including restrictions, presented on page 111 of this issue. Undoubtedly, many items which have been difficult to obtain in the past, now may be secured on this order under the heading of operating supplies. The order states this means any material which is essential to the operation of the producer's business, and which is consumed in the course of such business, including without limitation, fuel, lubricants, catalysts, and small perishable tools, provided it shall not include any material which is incorporated physically, in whole or in part in the product.

—□—

Because the price of primary aluminum was reduced from 17 to 15 cents per pound on Oct. 1, Leon Henderson has announced that the price of secondary aluminum shall be reduced approximately 2 cents per pound on Nov. 1. One wonders if Mr. Henderson is more interested in price parity than in production of the maximum volume of secondary aluminum to meet defense demands. Under the present circumstances I do not believe the price of primary aluminum has any bearing on the price of secondary. The entire output of primary is off the market and is being used by the government for airplane and certain Navy uses. Therefore, secondary should command a price sufficiently high to make maximum scrap collection profitable.

—□—

While General Metals Order No. 1, an inventory control of 16 types of metals, was revoked on Sept. 23, the director of priorities has pointed out that the restrictions of the order are continued through the following paragraph in Priorities Regulation No. 1:

> Unless specifically authorized by the Director of Priorities, no person shall, after the effective date of this regulation, knowingly make delivery of any material whatever, and no person shall accept delivery thereof, in an amount, quantity or number which will increase for any current month the inventory of such material of the person accepting delivery, in the same or other forms, in excess of the amount, quantity or number necessary to meet required deliveries of the products of the person accepting dilivery, on the basis of his current method and rate of operation.

—□—

A project to concentrate steel production on a minimum number of steel specifications has been started, at the request of OPM by the American Society for Testing Materials, Society of Automotive Engineers and the American Iron and Steel Institute, in collaboration with the War and Navy Departments. C. L. Warwick, consultant, OPM, and secretary-treasurer of the A.S.T.M. is head of the administrative committees.

—□—

More and more, the actions being taken at Washington provide news for the foundry industry. The following have been taken from press releases of defense agencies during the past month:

The Steel Casting Subcommittee organized under the Iron and Steel Defense Industry Advisory Committee consists of the following: F. B. Ernst, American Steel Foundries, Chicago; William H. Worrilow, Lebanon Steel Foundry, Lebanon, Pa.; Charles P. Whitehead, General Steel Castings Corp., Eddystone, Pa.; John E. McCauley, Birdsboro Steel Foundry & Machine Co., Birdsboro, Pa.; and D. C. Bakewell, Blaw-Knox Co., Pittsburgh.

Subcommittee on scrap has William McMillan, National Malleable & Steel Castings Co., Cleveland, as the representative of the foundry industry. Subcommittees also have been appointed on pig iron and cast iron pipe.

Prices of by-product foundry coke and by-product furnaces were frozen as of Oct. 1. Prices established by the order are given on page 133 of this issue.

The machine tool blanket priority was reissued on Sept. 30, as Preference Rating Order No. P-11-a. Ratings of A-1-a, A-1-b and A-1-c were assigned to producers of metal working equipment. Foundrymen should understand that a P-11-a, when extended by the machine tool manufacturer for the purchase of castings, cannot be extended for the procurement of foundry equipment.

—□—

On the last day of September the plant of the National Bronze & Aluminum Co., Cleveland, was almost destroyed by fire. The company has been engaged in the production of defense work, especially castings for aircraft. On the following Monday night, a Cleveland newspaper reported 300 molders had walked out of the John Harsch Bronze Foundry Co., Cleveland, that morning because the company had allowed National Bronze employes to prepare cores in the Harsch plant over the week end.

I could not help but contrast the reported action of the striking employes with my earliest experience, as a boy of seven, in the practical application of the good neighbor policy. At that time I was living in a small Indiana town which boasted of two weekly newspapers. Because of the limited field, both for advertising and circulation, the competitive spirit was especially keen. Early one morning fire struck at one of the plants and while the volunteer fire department, of which my father was foreman of the hook and ladder company, fought bravely, the damage, especially that caused by water, was severe. But the rival paper immediately came to the rescue, the employes of both papers lent a willing hand, and the victim of the conflagration made the weekly edition in grand style.

How can we talk of the good neighbor policy with the other countries on this hemisphere, if we refuse to help our own fellow citizens when in distress?

F. G. S.

AMENDMENT BROADENS MAINTENANCE AND REPAIR ORDER P-22

HUNDREDS of thousands of the nation's industrial plants, big and small, were granted the use of an A-10 priority rating to obtain maintenance and repair materials, in line with the recently expressed policy of the Supply Priorities and Allocations Board of keeping the economy in good running order.

The rating, granted by the Priorities Division of OPM, also can be used to obtain operating supplies (fuel, for example) which are used up in the manufacturing process. The plan is set forth in an amendment to a previous order (P-22), which was issued on Oct. 16 by Donald M. Nelson, director of priorities, Office of Production Management.

Need Only Statement

Any plant or business qualified to use the rating can do so without making application for its use. If a manufacturer needs a repair part, for example, he simply places his repair order with a supplier and on the face of the order and all copies signs the following statement:

> "Material for Maintenance, Repair, or Operating Supplies—Rating A-10 under Preference Rating Order P-22, as amended, with the terms of which I am familiar."

This constitutes legal use of the rating. And, since the A-10 rating denotes a defense need, the order placed must be accepted by the supplier under the terms of Regulation No. 1. The supplier may extend the rating in the same manner if necessary to obtain materials going into the producer's order. Suppliers may use the rating for their own repair and maintenance needs, of course, if they are qualified to do so under the terms of the order.

The order emphasizes the fact that the rating granted cannot be used to obtain anything except maintenance, repair and operating supplies *as these are defined in the order.*

The phrasing of the certification to be placed on all purchase orders for such materials make it mandatory for those using the order to be familiar with *all its terms before using it.*

Certain stipulations are included in the order to prevent improper use:

1. Purchase orders for repair, maintenance and operating supplies must be made up separately from all other orders, if the rating is used.

2. The rating must not be used if the material can be obtained without a rating.

3. Producers using the rating may do so only to obtain materials in quantities which are not above certain 1940 levels as defined in the order; provided, however, that the Director of Priorities may permit larger quantities of materials to be ordered and used in proportion to any increase in operations over last year's levels.

4. Misuse of the plan may result in direct punitive action.

5. Utilities and mines covered by separate repair orders are not covered by the present order. However, the plan does apply to all other establishments previously covered by Preference Order P-22, which is now revised by the new plan.

Since the foregoing is only an informal summary of the order's provisions, the full text of the order which follows must be read and studied by all those who expect to use it.

Title 32—National Defense
Chapter IX—Office of Production Management
Subchapter B—Priorities Division
Part 958—Repairs, Maintenance, and Supplies
Preference Rating Order P-22 Amended

Section 958.1, Preference Rating Order P-22, is hereby amended to read as follows:

958.1 For the purpose of facilitating the acquisition of Material for (1) the maintenance and repair of the property and equipment of producers as hereinafter defined and (2) the continued operation of the property and equipment of such producers, a preference rating is hereby assigned to deliveries of such Material upon the terms hereinafter set forth. Such terms shall control until such time as the Office of Production Management certifies specific quantities of such Material to which the preference rating herein assigned may be applied, or until the Office of Production Management may specifically limit production by any type of producer or withdraw any type of Material from use by such producer, or until the Office of Production Management may issue an order specifically relating to the maintenance, repair and operation of the property and equipment of any type of producer.

(a) *Statement of Policy.* It is the purpose of this Order to effectuate the policy of the Supply Priorities and Allocations Board in maintaining governmental, charitable and industrial property located in the United States, its territories and possessions, upon adequate operating basis, without expansion or improvement of facilities except where duly authorized or approved. The terms and conditions of this Order are to be interpreted in conformity with this expressed policy.

(b) *Definitions.*

(1) "Producer" means:

(i) any governmental unit;

(ii) any individual, partnership, association, corporation, or other form of enterprise engaged in one or more of the following activities or acting in one or more of the following capacities to the extent that it is so engaged or so acts:

(*a*) manufacturing, processing, or fabricating;

(*b*) warehousing — maintaining warehouses for storage or distribution of any Material;

(*c*) wholesaling—acting as a distributor of products sold to manufacturers, wholesalers, retailers, or other persons not consumers;

(*d*) charitable institutions—any charitable or eleemosynary institution which is recognized as such for purposes of the Internal Revenue Laws of the United States;

(*e*) carriers — urban, suburban and interurban common or contract carriers of passengers of freight by electric railway, electric coach, motor truck, or bus, including terminals of any of the foregoing; railroads, including terminals; shipping—commercial carriers of freight and passengers by ocean, lake, river, or canal, including terminals;

(*f*) educational institutions (including vocational training);

(*g*) printers and publishers;

(*h*) radio—commercial broadcasting and communication;

(*i*) telephone and telegraph communication, including wire services;

(*j*) hospitals, clinics and sanatoriums;

(*k*) Petroleum—discovery, development and depletion of petroleum pools.

(2) "Material" means any commodity, equipment, accessories, parts, assemblies or products of any kind.

(3) Subject to sub-paragraph (6), "Maintenance" means the up-keep of a Producer's property and equipment in sound working condition.

(4) Subject to sub-paragraph (6), "Repair" means the restoration of a Producer's property and equipment to a sound working condition when such property or equipment has been rendered unsafe or unfit for service by wear and tear, damage, destruction of parts, or similar causes.

(5) Subject to sub-paragraph (6), "Operating Supplies" means any Material which is essential to the operation of the Producer's business and which is consumed in the course of such business, including without limitation, fuel, lubricants, catalysts, and small perishable tools, *Provided:* it shall not include any Material which is physically incorporated, in whole or in part, into any product of the Producer, or into any Material which the Producer distributes to or stores, transports or services for another person.

(6) The terms "Maintenance," "Repair," and "Operating Supplies," *do not* include Material

(i) for the improvement of a Producer's property or equipment through the replacement of Material in the existing installation with Material of a better kind, quality or design;

(ii) for additions to, or expansion of, such property or equipment;

(iii) which is of a type not heretofore carried on the Producer's books under "Maintenance," "Repairs," "Operating Supplies" or the equivalent.

(7) "Supplier" means any person with whom a purchase order or contract has been placed by a Producer or another Supplier for Material.

(i) required by the Producer as operating Supplies or for the Maintenance or Repair of his property or equiment, or

(ii) to be physically incorporated in other Material so required by the Producer.

(c) *Assignment of Preference Rating.* Subject to the terms of this Order Preference Rating A-10 is hereby assigned:

(1) to deliveries, to a Producer, of Material required by him as Operating Supplies or for the Maintenance or Repair of his property or equipment;

(2) to deliveries, to any Supplier, of Material

(i) required by a Producer as Operating Supplies or for the Maintenance or Repair of his property or equipment, or

(ii) to be physically incorporated in other Material so required by a Producer.

(d) *Persons Entitled to Apply Preference Rating.* The preference rating hereby assigned may be applied by

(1) a producer;

(2) any Supplier provided deliveries to a Producer or another Supplier are to be made by him, which are of the kind specified in paragraph (c) and have been rated pursuant to this Order.

(e) *Application of Preference Rating.*

(1) A Producer or Supplier, in order to apply the preference rating to deliveries of Material to him, must endorse the following statement on the original and all copies of the purchase order or contract for such Material manually signed by a responsible official duly designated for such purpose by such Producer or Supplier:

> "Material for Maintenance, Repair, or Operating Supplies—Rating A-10 under Preference Rating Order P-22, as amended, with the terms of which I am familiar."

Such endorsement shall constitute a certification to the Office of Production Management that such Material is required for the purpose stated and that the application of the rating is authorized by this Order. Any such purchase order or contract for such Material shall be restricted to Material the delivery of which is rated in accordance herewith.

(2) The Producer or Supplier placing any such rated purchase order or contract and the Supplier selling the Material covered thereby must each retain endorsed copies of such purchase orders or contracts, segregated from all other purchase orders or contracts, for a period of two years from the dates thereof for inspection by authorized representatives of the Office of Production Management.

(f) *Restrictions on Application of Rating.* The preference rating hereby assigned shall not be applied

(1) unless the Material to be delivered cannot be secured when required without such rating;

(2) by a Producer, to obtain deliveries greater in quantity, or on dates earlier, than required for the Operation, Maintenance or Repair of such Producer's property or equipment;

(3) by a Supplier, to obtain Material for a delivery by him which has not been rated pursuant to this Order;

(4) by any Producer or Supplier to obtain scarce Material the use of which could be eliminated without serious loss of efficiency by substitution of less scarce Material or by simplification of design.

(g) *Restrictions on Deliveries, Withdrawals and Inventory.*

(1) Except as provided in paragraph (g) (5), no Producer shall, during any Calendar Quarterly Period, accept deliveries (whether or not rated pursuant to this Order) of any items of Material to be used as Operating Supplies or for Maintenance or Repair the aggregate dollar volume of which shall exceed 25% of the aggregate dollar volume of the withdrawals of items of Material of the same class as carried on the Producer's books from stores or inventory during the calendar year 1940.

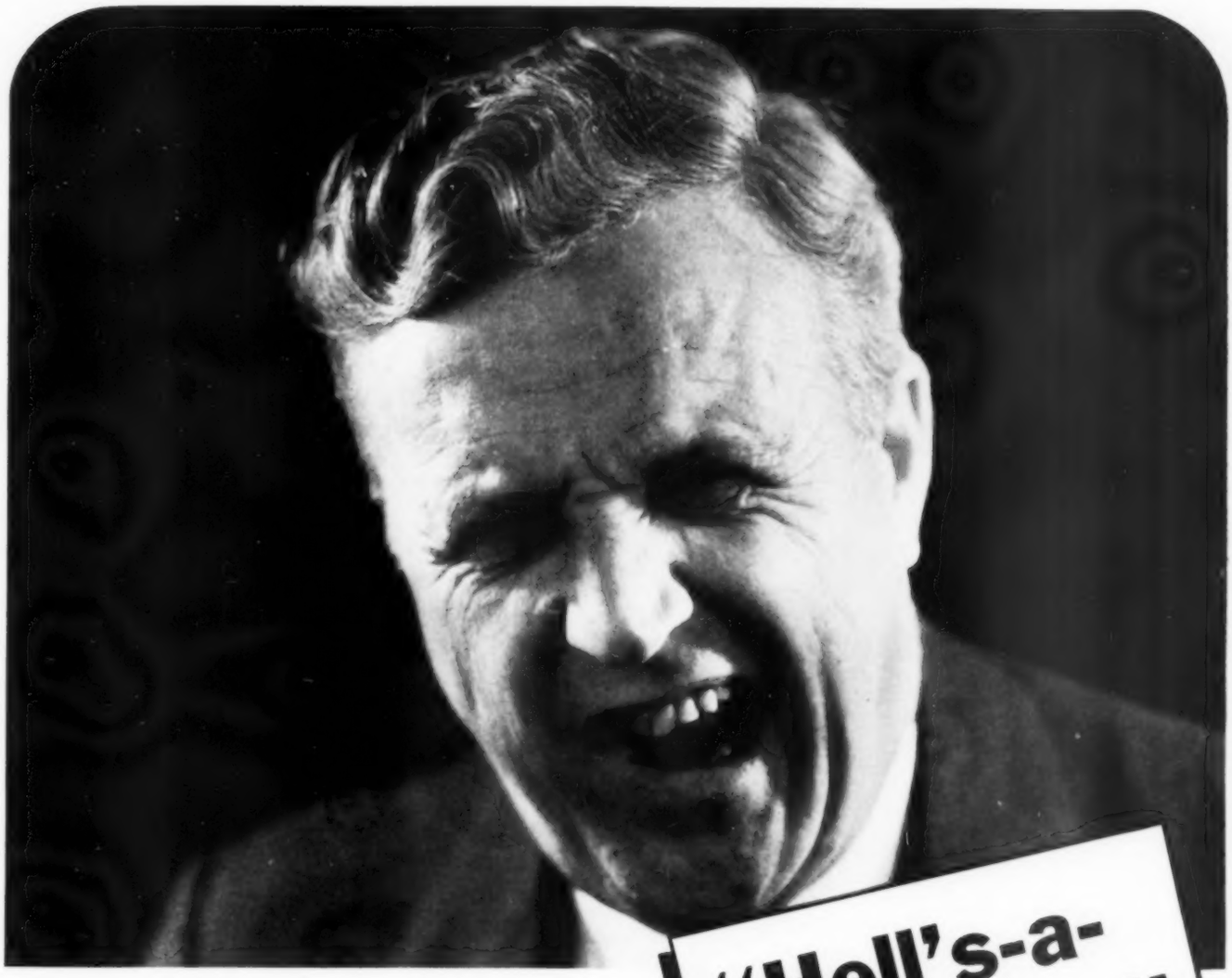
(2) Except as provided in paragraph (g) (5), no Producer shall, at any time, accept deliveries (whether or not rated pursuant to this Order) of any item of Material to be used as Operating Supplies or for Maintenance or Repair until the Producer's inventory and stores of items of Material of the same class, as carried on the Producer's books, have been reduced to a practical working minimum. Such practical minimum shall in no case exceed the aggregate dollar volume of items of Material of the same class, as carried on the Producer's books, in inventory and stores on December 31, 1940, or, at the Producer's option, at the close of the Producer's fiscal year ending during the calendar year 1940.

(3) Except as provided in paragraph (g) (5), no Producer shall, during any Calendar Quarterly Period, make withdrawals from stores or inventory of any items of Material to be used as Operating Supplies or for Maintenance or Repair the aggregate dollar volume of which shall exceed the aggregate dollar value of the withdrawals of such items of Material of the same class, as carried on the Produce 's books, during the corresponding quarter of 1940, or, at the Producer's option, 25% of the aggregate dollar volume of the withdrawals of such items of Material of the same class as carried on the Producer's books during the calendar year 1940.

(4) Notwithstanding the provisions contained in paragraph (g) (1), (2), and (3), a Producer may, upon application to and with the approval of the Director of Priorities, in any Calendar Quarter increase the aggregate dollar volume of deliveries accepted of Material for use for Maintenance and Repair or as Operating Supplies, withdrawals of Material for such use, or inventory of Material for such use over the aggregate dollar volume of deliveries, withdrawals or inventory of Material for such uses during the last preceding corresponding Calendar Quarter proportionately to the increase of the volume of goods or services produced or rendered by him in such quarters.

(5) Restrictions contained in paragraphs (g) (1), (2), and (3) shall not apply to any Producer during any Calendar Quarterly Period in which the total volume of his purchases or withdrawals of Material for Maintenance, Repairs, and Operating Supplies does not exceed

(*Concluded on page* 114)



"Hell's-a-Poppin"

Hell's-a-poppin in many a foundry throughout the U.S.A. today because delivery schedules are not being maintained. Orders from customers of long standing are regretfully being turned down because these foundries *seem* not to have the capacity to take care of their regular customers and Defense requirements too. Yet a careful analysis by a skilled production engineer has often indicated the possibility of increasing production several hundred percent without any great change in existing facilities!

As an example, Herman engineers are regularly demonstrating the feasibility of increasing mold production three and four hundred percent while at the same time improving mold excellence and casting quality. This is made possible by Herman's vast experience in successfully meeting thousands of molding problems of all types in all kinds of foundries. Exclusive Herman patents provide distinct operating economies, increased accuracy, and speed.

Look into your molding department. Is it the bottleneck of your production set-up? Can it be improved? A skilled Herman engineer will give you an unbiased answer without obligation. Your invitation is solicited.

MOLDING HERMAN MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

(*Concluded from page* 112)

$2,500.

(h) *Audits and Reports.*

(1) Each Producer or Supplier who applies the preference rating hereby assigned, and each person who accepts a purchase order or contract for Material to which the preference rating is applied, shall submit from time to time to an audit and inspection by duly authorized representatives of the Office of Production Management.

(2) Each such Producer or Supplier shall execute and file with the Office of Production Management such reports and questionnaires as said Office shall from time to time request. No such reports shall be filed until such time as the proper forms are prescribed by the Office of Production Management.

(i) *Utilities and Mines Excepted.* This Order is not applicable to any Utility defined as a Producer in Preference Rating Order No. P-46 (section 978.1), nor to any Mine as defined in Preference Rating Order No. P-56 (section 982.1). The Director of Priorities may from time to time specifically except further classes of Producers from this Order by specific direction.

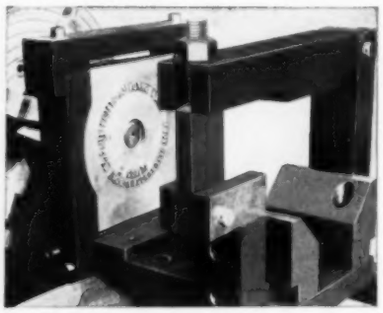
(j) *False Statements and Penalties.* Any person who applies the preference rating hereby assigned in wilful violation of the terms and provisions of this Order or wilfully falsifies any records which he is required to keep by this Order, or who obtains a delivery of Material by means of a material and wilful misstatement will be forbidden to further apply said rating. Such person may also be prohibited from obtaining further deliveries of Material under allocation and be deprived of any other priorities assistance. The Director of Priorities may also take any other action deemed appropriate, including the making of a recommendatioin for prosecution under section 35A of the Criminal Code (18 U.S.C. 80).

(k) *Revocation or Modification.* This Order may be revoked or amended by the Director of Priorities at any time as to any Producer or Supplier. In the event of revocation, or upon expiration of this Order, deliveries already rated pursuant to this Order shall be completed in accordance with said rating, but no applications of this rating to any other deliveries shall thereafter be made by the Producer or Supplier affected by said revocation or expiration.

(l) *Effective Date.* This Order shall take effect immediately, and unless sooner revoked shall expire on the 1st day of April, 1942.

Shell Marker

M. E. Cunningham Co., Pittsburgh, has a new shell marking machine for stamping details on the bases of finished shells. The machine shown in the accompanying illustration can be fitted into any production line it is claimed with the minimum setting up cost. It can be supplied as a complete motor driven unit or as a fixture for setting up on an ordinary lathe. Motor driven machine is constructed with a rotating head. Shell is held securely in place by a steel clamp, and pressure to force shell against type is obtained by a tailstock attachment. Each character is said to be driven into the shell base separately without great pressure or shock and a clear impression is obtained.



Acoustic Booth

Acoustic division, Burgess Battery Co., Chicago, has placed on the market a new conference booth constructed of acoustic materials for absorption of sound to provide a zone of quiet in noisy places. The booth shown in the accompanying illustration may be used for conferences, a miniature office, or for testing operations which require a quiet place. Exterior is heavy gage steel with black wrinkle finish, and interior is gray sound absorbing material. Outside dimensions are 54½ x 56½ x 79½ inches. Doorless entrance permits easy access, and ample ventilation. Folding table 23½ x 24 inches and overhead light add to convenience. Shipping weight is 1000 pounds.

The Foundry Locates Him After Twenty-eight Years

THROUGH an advertisement in THE FOUNDRY, a Providence, R. I., septuagenarian will recover a long forgotten bank account to tide him through the twilight of life.

Back in 1913, Roderick E. Nevers was employed as a pattern maker by the American-LaFrance-Foamite Corp., Elmira, N. Y. In that year Mr. Nevers placed $1700 in certificates of deposit in the Chemung Canal Trust Co. and also $490 in checking account with the same institution. Shortly after he made the deposits, Mr. Nevers left Elmira and his accounts remained unclaimed.

Under New York laws, the state claims accounts which are abandoned for a specified period of years. The Nevers account was about to fall into this category when Vice President Paul G. Kingston, Chemung Canal Trust Co. instituted a search two years ago for the missing depositor.

Scores of communities in several states were canvassed through Chambers of Commerce, banks, postmasters and even courts handling estates. The Pattern Makers League of North America was unable to give information of Mr. Nevers' whereabouts.

Through a happy inspiration, Mr. Kingston placed an advertisement in THE FOUNDRY and it was read by Robert P. O'Brien, owner of a brass foundry and pattern works at Providence, R. I. Mr. O'Brien has known Mr. Nevers for many years and forwarded his address to the Elmira Bank. The original certificates of deposit have since been found in an old trunk owned by Mr. Nevers and the necessary legal steps are being taken to turn the funds over to him.

PRODUCTION RECORDS *Can Be Broken Here...*

USING the correct wheel for the particular metal to be ground is one good way to "top" production demands. Careful selection of the right grain, bond, size, and shape has also been found to produce economical results!

For example, changing wheels to conform to the demands of each job is a simple way to speed up any kind of portable grinding. Such wheels, correctly selected, are safe, and easier to use . . make men less tired . . able to turn out more and better work.

If porduction problems are worrying you, please feel free to ask for the services of a Sterling engineer. He is often able to recommend better use of the wheels you may already have . . show your workmen how to obtain longer wheel service and better results.

Write today . . a Sterling engineer will gladly call at no obligation . . this is our contribution to the demands of the present emergency.

Send for your copy of the "Safety Code for the Use, Care, and Protection of Abrasive Wheels." This 36 page book is worthy of careful study. May we send it . . free?

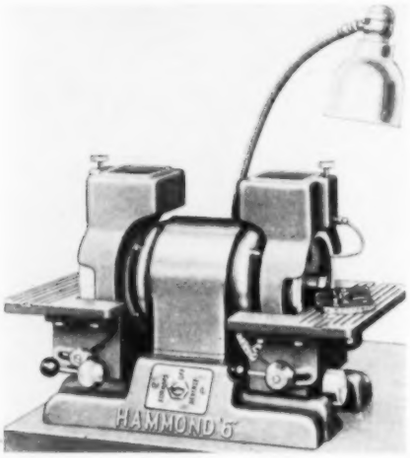
• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

Tool Grinder

Hammond Machinery Builders, Inc., Kalamazoo, Mich., recently has placed on the market a new carbide tool grinder equipped with a 6-inch silicon carbide or diamond cup wheel. Extra heavy tilting table



easily is removable. No tools required. A single clamp releases table to mount new wheel. Table is slotted for the protractor angle guide. Inside edge of table is machined inward at an angle to permit tilting without any readjustment of distance between table and wheel. Cast iron support serves also as a sludge pan, easily removed for cleaning by releasing the same clamp that locks the tilting table to the shaft. For accuracy in grinding angles a plainly marked indicator ranging from 0 to 25 degrees is mounted directly beneath the table. Table slides on machined quadrants and tilts easily to the desired angle. Motor is heavy duty type ½ horsepower running at 3450 revolutions per minute in over size precision ball bearings. Motor is controlled from switch at the front and is reversible for right or left operation. Brake is built in. For wet grinding an integral wheel guard and coolant tank as shown in the illustration easily may be substituted for the standard cast iron wheel guard.

Man Cooler

DeBothezat Ventilating Equipment Division, American Machine & Metals, Inc., East Moline, Ill., has developed a new man cooler especially designed for reducing fatigue of workman in foundries, forges, and steel mills where they are exposed to radiant heat from furnaces, forges and molten metal. The device is column mounted and may be adjusted to blow a blast of cooling air in any direction in concentrated stream to remote points without the aid of ducts. It combines a high efficiency flow pressure fan and an aerodynamically proportioned conversion nozzle where the static pressure produced by the fan is converted into velocity energy. The fan wheel operates at peak efficiency resulting in the maximum energy transfer from electric power line to air stream. Curved radial vanes in the conversion nozzle assist in producing an air stream of long, narrow jet effect with minimum tendency to diverge. The non-overloading type fan wheel is a safe guard against burnt out motor and shut down.

Enclosed Motors

As shown in the accompanying illustration Century Electric Co., St. Louis, has improved the appearance and internal design of its new line of totally enclosed fan cooled motors. They are said to provide the necessary protection in dusty atmospheres where abnormal quantities of metallic abrasive and other dusts may be present. Air passages are large to permit passage of

plenty of cooling air over the windings. Air intake passages are claimed not to be easily clogged and designed so that a 5/16-inch rod will not pass through them.

Electric Drill

Mall Tool Co., Chicago, has developed a new pistol-grip, ¼-inch drill for use in close quarters. As shown in the accompanying illustration, the drill is streamline de-

sign. The housing is an aluminum alloy die casting with cast-in steel inserts for bearing containers. Brushes are said to be extra long, and easily accessible openings are provided for cleaning commutator and for brush inspection. Armature is balanced to provide smooth running, and gears are alloy steel. No load speed is 2200 revolutions per minute, and full load speed is 1800 revolutions per minute. Net weight with cord is 4 pounds.

Speed Lathe

Standard Electrical Tool Co., Cincinnati, recently has added to its line of speed lathes the double-end arrangement shown in the accompanying illustration. The construc-

tion permits the spindle at each end to be operated individually without interfering with the other. Combination clutch and brake is incorporated in each spindle housing which is operated through hand lever as illustrated or by foot pedal control. Simultaneous action disengages clutch and applies brake, stopping work spindle, while motor continues to operate. The unit is available in ½, 1 and 2 horsepower sizes with any standard motor speed.

Bright Dip

A recent British patent describes a bright dipping solution for copper or copper plated articles which is claimed to avoid the objectionable evolution of nitric oxide and the necessity for exhaust ducts. Etching action of the dip is decreased so that the work may be drained adequately before rinsing. Optimum values of the ingredients per gallon of water are approximately 2780 grams concentrated sulphuric acid, 535 grams concentrated nitric acid, 23 grams concentrated hydrochloric acid, and 1131 grams commercial chromic acid.

Eastern Clay Products Inc., Eifort, O., is constructing a bentonite plant at Belle Fourche, S. Dak., which includes a mill building 50 x 125 feet, and a crude clay building 50 x 120 feet.

FOUNDRY ACTIVITIES

AMERICAN Hammered Piston Ring division, Koppers Co., Burk and Hamburg streets, Baltimore, is building a plant for production of aircraft engine parts. Project to cost $1,250,000 of which about $900,000 will be for machinery and equipment.

* * *

Belding Foundry Co., Belding, Mich., is erecting a plant addition.

* * *

Titusville Iron Works Co., Titusville, Pa., will build a one-story addition to cost about $50,000.

* * *

Western Steel Casting Co., 145 Horton street, Seattle, will build a foundry addition 40 x 70 feet.

* * *

Pelton Steel Casting Co., West Dewey place, Milwaukee, is building an addition 60 x 134 feet.

* * *

Elyria Foundry Co., Elyria, O., has let contract for a casting and cleaning building to cost about $75,000.

* *

Wellman Bronze & Aluminum Foundry Co., Cleveland, has been granted a loan of $194,221 from the Defense Plant Corp.

* * *

Continental Roll & Steel Foundry Co., East Chicago, Ind., recently was granted a loan of $3,283,010 by the Defense Plant Corp.

* * *

Buckeye Brass & Aluminum Co., Tiffin, O., has completed a new foundry with a capacity of 15 tons per week.

* * *

Sterling Aluminum Products Co. Inc., St. Louis, is building a one-story addition to its plant covering 4000 square feet and costing $15,000.

* * *

American Steel Castings Co., Avenue L, Newark, N. J., will expand its foundry and manufacturing plant at a cost of approximately $500,000.

* * *

Coulter Copper & Brass Co. Ltd., 115 Sumach street, Toronto, Ont., is building a plant addition to cost $30,000 without equipment.

* * *

Perfect Circle Co., Hagerstown, Ind., has built a 2-story wing to its foundry in New Castle, Ind. The foundry addition includes space for new mold conveyors, sand conveyors, sand conditioning equipment, laboratory, metallurgical department and offices.

* * *

Apex Steel Corp., 6111 South Eastern avenue, Bell, Calif., is adding 10,000 square feet floor space to its foundry.

* * *

Ford Motor Co. is planning the construction of a steel foundry 286 x 352 feet at the Rouge plant, Dearborn, Mich.

* * *

Electric Steel Co. Ltd., Cap de la Madeleine, Que., is completing arrangements for a plant addition to cost $175,000.

* * *

General Steel Casting Corp., Eddystone, Pa., has been loaned $14,000,000 by the Defense Plant Corp. for producing ordnance equipment.

* * *

Rogers Iron Works, East Joplin, Mo., is planning a plant extension to its foundry. Land to the north of the foundry is being vacated to permit extension.

* * *

Westlectric Castings Co. Inc., 2040 Canfield avenue, Los Angeles, is building a 6000-square foot foundry addition for production of iron and steel castings.

* * *

Manganese Steel Castings Ltd., Sherbrooke, Que., will build a foundry addition to cost about $75,000 with equipment. H. R. Neville is manager.

* * *

Robert Mitchell Co. Ltd., 750 Belair avenue, Ville street, Laurent, Que., will build a foundry and machine shop to cost about $85,000 with equipment.

* * *

Pacific Brass Foundry of San Francisco Inc., Second and Clementine streets, San Francisco, is planning a one-story foundry plant to cost about $40,000.

* * *

Geneva Metal Wheel Co., Geneva, O., is building an addition 27 x 80 feet for sand and pig iron storage, and a warehouse addition 60 x 85 feet.

* * *

Acme Aluminum Foundry Co., 6724 South Chicago avenue, Chicago, has acquired a plot of land, 125 x 125 feet, adjacent to its brass plant, to be used later for an addition.

* * *

Master Casting Co., 2621 West Fort street, Detroit, has been organized for the production of aluminum, brass and bronze castings. William Gordon is owner and Leo Krom is foundry superintendent.

* * *

Alloy Brass Foundry is the firm name under which Frank Casalicchio and Lillian Casalicchio have obtained a certificate to conduct business at 2454 East Fifty-seventh street, Los Angeles.

* * *

National Bronze & Aluminum Foundry Co., Cleveland, which recently suffered a disastrous fire, has acquired the former Cleveland plant of the Industrial Brownhoist Corp., East Forty-fifth and Hamilton avenue.

* * *

Dunkirk Foundries Inc., Dunkirk, N. Y., has purchased the equipment and patterns of the Buffalo Brass Castings Co., Buffalo. The Dunkirk company operates a machine shop and pattern shop in connection with its foundry.

* * *

Rochester Metal Products, Rochester, Ind., has completed an addition to its foundry 50 x 188 feet, increasing molding floor capacity to permit installation of 15 molding stations. Jack Davis is superintendent and Clifford Lowe, foreman.

* * *

Ideal Foundry Co., 329 Summer avenue North West, Grand Rapids, Mich., is erecting an addition of approximately 10,000 square feet to its foundry, and modernizing its buildings with new equipment. Emmet W. Glaser is president and treasurer, John DeBoer is works and sales manager.

* * *

Index of foundry orders for September, 1941, according to a report of the Foundry Equipment Manufacturers' Association, Cleveland, was 363.8 as compared with 312.9 in August. Index of orders for new equipment was 372.0 and for repairs 339.2. The index of 100 represents the monthly average of reported sales to metal working industries during 1937-38-39.

BRITISH INSTITUTE OF METALS INVESTIGATES POROSITY

By VINCENT DELPORT
European Manager, The Foundry

THE British Institute of Metals held its thirty-third annual Autumn meeting on Sept. 17, at its own assembly room in London. Dr. C. H. Desch, National Physical Laboratory, Teddington, past president, occupied the Chair in the absence abroad of the president, Lieut. Colonel R. M. Preston.

Four papers were presented, the first being "Causes of Porosity in Tin-Bronze Castings," by T. F. Pearson, Fuel Officer, Colville, Ltd., Clydebridge Steelworks, and W. A. Baker, Investigator, British Non-Ferrous Metals Research Association, London. The paper described extensive tests that were made to determine the influence of shrinkage and of dissolved gases on the incidence of porosity in tin-bronze, using a melting and casting technique which permitted very close control of all conditions and yielded strictly comparable test results. The degree of porosity was estimated from density measurements and tensile tests were made on the castings.

Bronze Castings Are Defective

The bronzes are very prone to dispersed shrinkage unsoundness by reason of the long freezing range of the alloys. This unsoundness often appears as tortuous interdendritic fissures, which have comparatively little effect on density but are very detrimental to mechanical properties. The alloys are also prone to unsoundness resulting from the evolution of hydrogen, water vapor, carbon monoxide and sulphur dioxide, the extent of the gas porosity being greatest from the first-mentioned two causes and very much less marked from the last-mentioned gases. Carbon dioxide and nitrogen are inert to the alloys. Gas porosity generally takes the same form as shrinkage unsoundness except in grossly unsound castings, where the cavities may appear approximately spherical in shape.

The reaction between water vapor and molten bronze is reversible and it is shown that oxidation and/or deoxidation are effective for the purpose of preventing or minimizing unsoundness resulting from exposure of melts to moist atmospheres. The generally accepted practice of melting in slightly oxidizing atmospheres is thus justified. The evidence indicates, however, that elements with a high affinity for oxygen, such for example as phosphorus, will, if present, hinder the expulsion of reducing gases by oxidation.

Dr. R. Bailey, Metropolitan-Vickers Electrical Co. Ltd., opened the discussion by saying that steam unsoundness appeared to be a minor trouble, hydrogen, in his opinion, being more important. That indicates that hydrogen could be eliminated by oxidation. He referred to the method of degasification indicated by H. Lepp and said this method might improve the soundness of ingots. Dr. Watson, Royal Mint, pointed out that the conditions of operation described in the paper were not the same as in practice; for instance, the rate of pouring was slower. Another speaker cited foundries using as much as 98 per cent scrap with good results, densities being obtained as high as 8.8. D. Yates, mentioned that he had had experience with gun metal and phosphor bronze in rather poor conditions of equipment and he had met with the defects mentioned in the paper; he had improved his results by using oxidizing fluxes. He criticized the commercial method of passing castings simply by examining the machined surface. He said the only way to ensure sound castings was by a careful control of technique, but this is sometimes difficult in ordinary bronze foundries. Dr. Northcott, London, said he would like to see the type of unsoundness referred to in the paper discussed in relation to the conditions of failure. Dr. Desch, closing the discussion, reminded the meeting that in 1914 some foundries made castings above the required specifications by using great care in the technique of manufacture.

The next paper was entitled "Unsoundness in Gravity Die-Cast Silicon-Aluminum Alloy Pistons," by R. T. Parker, Research Metallurgist, Research and Development Dept., Northern Aluminium Company, Ltd., Banbury. The paper described how the incidence of unsoundness in the skirts of small 12 per cent silicon-aluminum alloy pistons was investigated under practical conditions. The unsoundness took the form of fine cavities, revealed after machining the surface, in positions remote from the runner and riser.

The factors which were kept in mind in attacking the problem were gas contamination, machining technique, and temperature of the die-assembly in which the pistons were cast.

Comparison of atmospheric conditions with the percentage of scrap obtained in the foundry showed only a vague relationship. Over periods of some weeks increases in atmospheric humidity were followed by general increases in percentage of scrap, while in several instances sharp daily variations in humidity were followed by sharp changes in the percentage of scrap. A brief examination of a piston after diamond machining by independent operators showed that small cavities may be disclosed or concealed according to the technique adopted.

Gas Content Varies

Two experiments, in which pistons were cast from metal having a high or low gas content into a die-assembly fitted with thermocouples, demonstrated clearly the effects of variation in the gas content of the metal and temperature of the die-assembly. of micrographic and X-ray methods of examination, the latter proved far more useful in assessing the soundness of the pistons. A well-marked relationship between soundness and die-assembly temperature was observed, the hotter assembly giving the better results. With metal of both high and low gas content, pistons of reasonable soundness were obtained at higher assembly temperatures; but at lower assembly temperatures the metal of low gas content gave pistons of inferior quality containing localized unsoundness. Pistons from metal of high gas content contained unsoundness of a finer and more general type, owing to the dispersive effect of the gas present.

Therefore, the variation in gas content explained differences in the type of unsoundness observed. Variations in the atmospheric humidity could be admitted as only partially responsible for a hitherto unexplained periodicity in incidence of the unsoundness. Variations in machining technique were considered of much more importance in this respect. The relationship between die-assembly temperatures and soundness of the pistons points to a way of obtaining an immediate improvement in quality, although a coincidental improvement in quality of

(*Concluded on page* 122)

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(*Concluded from page* 120)
the metal is also desirable.

E. Liddiard, British Non-ferrous Metals Research Association, pointed out in the discussion that gas is not the only cause of unsoundness; f.i. holding the metal in a pot for a length of time affects the grain size. Density determination should be used in such investigations as it gives a good measure of porosity.

The other two papers were: "The Influence of Crystal Structure on the Cold Rolling and Annealing of Copper Strip," by Maurice Cook, and T. Ll. Richards, Research Department, I. C. I. Metals, Ltd., and "X-Ray Examination of the Crystal Structures of Rolled Magnesium and a Magnesium Alloy," by D. E. Thomas, Research Department, Woolwich.

PLACE IRON AND STEEL SCRAP UNDER PRIORITY

ON Oct. 11 Donald M. Nelson, director of priorities, Office of Production Management, issued General Preference Order M-24 which imposes a mandatory priority system upon the iron and steel scrap industry.

Among the more important provisions of the Order are the following:

(1) The provisions and controls of Priorities Regulation No. 1 are specifically extended to the iron and steel scrap industry. A copy of this Regulation is attached. It requires the acceptance and preferential treatment of defense orders, prescribes the sequence in which deliveries shall be made, and establishes certain requirements for the keeping of records, etc. These provisions are effective at once.

File Monthly Reports

(2) Monthly reports are required of producers, consumers, dealers, and brokers, who are defined in the Order. Forms of reports with complete instructions will be furnished shortly. These forms may be reproduced by persons for their own use or additional copies may be obtained from the Iron and Steel Branch, Office of Production Management. Note that the Order requires the filing of reports on the 15th day of each month, covering the preceding month. The first report will be due on Nov. 15, 1941.

(3) The Director of Priorities is given broad powers to control deliveries of scrap. This provision is effective at once.

Notification will be given from time to time of rulings and interpretations applying to this Order. Any questions which may arise in connection with your compliance with the terms of this Order should be addresed to Mr. A. D. Whiteside, Chief, Iron and Steel Branch, Office of Production Management, Washington.

Text of the order follows:

Title 32—National Defense

Chapter IX—Office of Production Management

Subchapter B—Priorities Division

Part 965—Iron and Steel Scrap

General Preference Order M-24 To Conserve the Supply and To Direct the Distribution of Iron and Steel Scrap

Whereas, the national defense requirements have created a shortage of iron and steel scrap for defense, for private account, and for export, and it is necessary in the public interest and to promote the defense of the United States to conserve the supply and direct the distribution thereof.

Now, therefore, it is hereby ordered:

965.1 General preference order. (*a*) *Priority Control.* All the provisions and definitions of Priorities Regulation No. 1, issued by the Director of Priorities on Aug. 27, 1941 (Part 944), as amended from time to time, are hereby included as a part of this Order with the same effect as if specifically set forth herein, except as otherwise specifically provided herein.

(*b*) *Additional Definitions.* For the purpose of this Order:

(1) "Scrap" means "all ferrous materials, either alloyed or unalloyed, of which iron or steel is a principal component, which are the waste of industrial fabrication, or objects that have been discarded on account of obsolescence, failure or other reason."

(2) "Producer" means any person who produces Scrap in the conduct of a business or other enterprise.

(3) "Dealer" and/or "Broker" means any person who, as principal or as agent, buys and sells Scrap in the regular course of his business.

(4) "Consumer" means any person who uses Scrap in the production of iron, steel or ferroalloy material or products.

(*c*) *Provisions relating to Producers.* On or before the 15th day of each month, beginning Nov. 15, 1941, Producers who have during the preceding month produced 20 gross tons or more of Scrap shall file reports as prescribed by the Director of Priorities showing Scrap inventory, production and sales, and such other information as the Director may from time to time require.

(*d*) *Provisions relating to Dealers and Brokers.* On or before the 15th day of each month, beginning Nov. 15, 1941, Dealers and Brokers shall file reports as prescribed by the Director of Priorities, showing Scrap inventory, purchases and sales, and such other information as the Director may from time to time require.

(*e*) *Provisions relating to Consumers.* On or before the 15th day of each month, beginning Nov. 15, 1941, Consumers shall file reports as prescribed by the Director of Priorities, showing Scrap inventory, production, receipts and consumption, and such other information as the Director may from time to time require.

(*f*) *Special Instructions.* The Director of Priorities may from time to time issue specific directions to any person as to the source, destination, or amount of Scrap to be delivered or acquired by such person.

(*g*) *Violations.* Any person affected by this Order who falsifies records or reports which he is required by this Order to keep or file, or who violates any other provision of this Order or any other Order, regulation, or other directive issued by the Office of Production Management may be prohibited by the Director of Priorities from making or receiving deliveries of Scrap, or may be subjected to such other or further action as the Director may deem appropriate.

(*h*) *Effective Dates.* This order shall take effect immediately, and, unless sooner terminated by direction of the Director of Priorities, shall expire on the 30th day of June, 1942.

Has Publication

The Ajax Metal Co. and divisions, Philadelphia, is issuing a new magazine for metals executives. The new publication, known as *Ajax Metelectric Progress*, will be published bimonthly. Describing the magazine as, "an act of communication in fields where practical applications tread so closely on research as to be news rather than theory," Dr. G. H. Clamer, president of Ajax, asserts that the day of commercial secretiveness has virtually ended in the pooling of resources and knowledges for America's defense effort. *Ajax Metelectric Progress* will be edited by Howard Linn Edsall, formerly of the staff of the *Philadelphia Public Ledger*.

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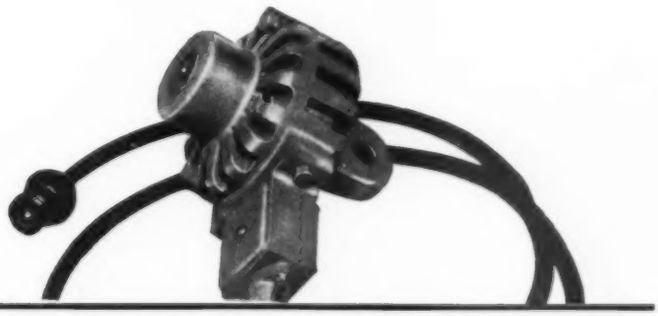

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No. 1—Light match plate work..... $10.00	No. 5—Heavy match plate, tub, bench $17.00
No. 2—Medium match plate 13.00	No. 9—Machine and heavier 24.00

•

FOUNDRY SUPPLIES MANUFACTURING CO.

2221 Orchard Street Chicago, Illinois

CABLE ADDRESS: "ROTOPLANE CHICAGO"

CAST STEEL MORTAR SHELLS

(*Continued from page* 55)

determinations are made for sulphur, phosphorus and chromium contents of the steel.

On heats for Army Ordnance shells two keel blocks are poured from the fifteenth and thirtieth ladles and from those same ladles a mold is tagged for identification. Shells from those molds are selected for fragmentation tests which are conducted at Picatinny Arsenal. Selection usually is based on high and low chemical analysis, generally on the carbon content. One keel block is used for determination of physical properties, which is witnessed by the government inspector, and the other is held until an official o. k. is received from the War department. Drillings on each heat also are forwarded to that department.

Shell molds are made on a battery of 10 molding machines arranged in a line along an overhead mold conveyor supplied by the Link-Belt Co., Chicago. The mold conveyor contains 182 stations and the rate of speed of the conveyor is such that approximately one hour intervenes from the time the mold is placed on the carrier until it is shaken out. The total sand system contains about 100 tons of molding sand of which 30 tons is in the molds on the conveyor, and 70 tons in two storage bins of 35 tons capacity each.

In the sand handling system excess sand at the molding stations, and that at the shakeout drops through floor gratings on to pusher type conveyors where some tempering water is added to decrease dusting. From the pusher conveyors the sand is belt-fed to an elevator. Thence it passes over a magnetic separator and through a rotary screen which is located over the storage bins. Cores and other extraneous material are by-passed to a chute. An exhaust fan above the rotary screen serves to remove the dust.

From the storage bins the sand drops into two sand mullers of 1500-pound capacity each, made by the National Engineering Co., Chicago. Sufficient bentonite clay and moisture are added to bring the moisture within the desired range of 2 to 3 per cent and the bond up to 3½ per cent. Permeability of the heap or green sand ranges from 212 to 226, and sand determinations are made frequently to maintain the proper control. The sand is mixed in the mullers from 2 to 4 minutes and then discharged on to a belt conveyor. From that it goes to an elevator where it falls onto a belt conveyor which feeds a pusher type conveyor located over the molding station sand bins.

Drag molds for the shells which are molded and cast in the vertical position are made on five jolt, roll-over, pattern draw molding machines made by the Osborn Mfg. Co., Cleveland, and cope molds are produced on five jolt squeeze molding machines made by the International Molding Machine Co., Chicago. Cast steel flasks are used. The American 60 millimeter mortar shells are mounted in two rows of 6, or 12 on a plate. Pouring sprue is located in the center with a main runner extending between the two rows of shell patterns. Branch gates at right angles to the main runner extend into casting cavities. Since the British mortar shell is somewhat larger—3-inch—only 8 are mounted on a plate in two groups of four each. As in the case of American shell, the pouring sprue is in the center with a main runner extending to the x-form gates which feed into each group of four cavities.

Use Mold Facing

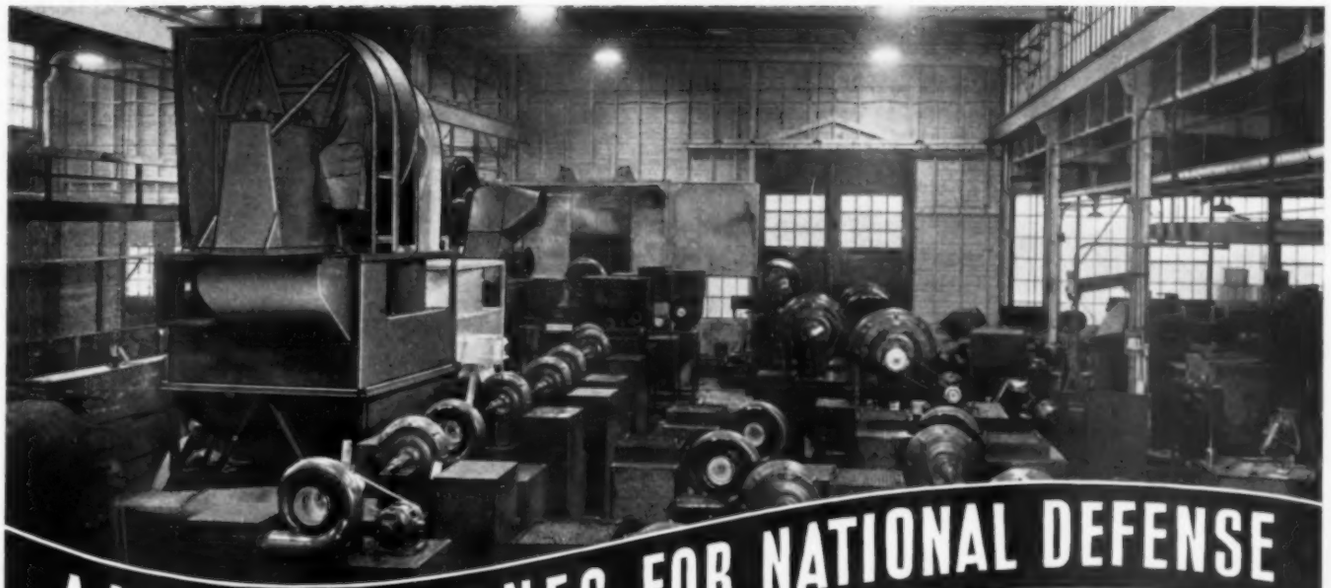
Approximately half the shell casting is located in the drag, and half in the cope, and to insure a high quality surface on the exterior, the molds are faced with specially prepared facing sands available in boxes at each molding station. Facing for the British shells is comprised of all new silica sand with an A. F. A. grain fineness of 48 to 52 to which 70 pounds of bentonite is added per 3000 pounds of sand. The facing sand for the American shells is composed of half heap molding sand and half new silica sand. Since the mixture already contains some bond only 20 pounds of bentonite is added to a 3000-pound batch. Moisture content of the facings ranges from 1.8 to 2.0 per cent; green compression is about 5 pounds per square inch, and permeability ranges from 212 to 226. Each batch of sand is tested to insure that it is in the proper condition.

Two men operate each drag machine and two operate the cope machines. In addition to those, one man sets the cores in position while two men gage the cores with a jig or template which locates them in the mold for concentricity and height. The core gage, constructed of aluminum, fits down on the flask pins, and contains recesses into which the projecting ends of the cores slide as the gage is forced down into position. Approximately 45,000 to 50,000 American shells are produced on two shifts while in the case of the larger and heavier British shell the production is 22,000 to 25,000 for the same period of time.

Molds on the conveyors are poured from 350-pound ladles as they move slowly along. After a cooling period the molds reach the shakeout where they are dumped on a vibrating screen which effectively separates the castings from molding sand and cores. The castings then are dumped on the floor where they are knocked off the gates and runners with a sledge hammer. The

(*Concluded on page* 126)

On Oct. 7 three firms participated in a ceremony wherein the millionth finished, 60 millimeter cast steel mortar shell was presented to Lieutenant Colonel D. N. Hauseman, commanding officer in charge of ordnance production, Philadelphia district. The shells were cast by Auto Specialties Mfg. Co., St. Joseph, Mich., and machined by Lehigh Foundries Inc. and Merchant & Evans, both of Lancaster, Pa. In the illustration left to right are Waldo Tiscornia, Auto Specialties Mfg. Co.; Colonel Hauseman, Frank E. Schumann, Lehigh Foundries Inc., and Thomas Evans, Merchant & Evans. (Editors' Note) Description of the procedure employed in making cast steel mortar shells by Auto Specialties Mfg. Co. appears on page 50 of this issue.



AAF ROTO-CLONES FOR NATIONAL DEFENSE

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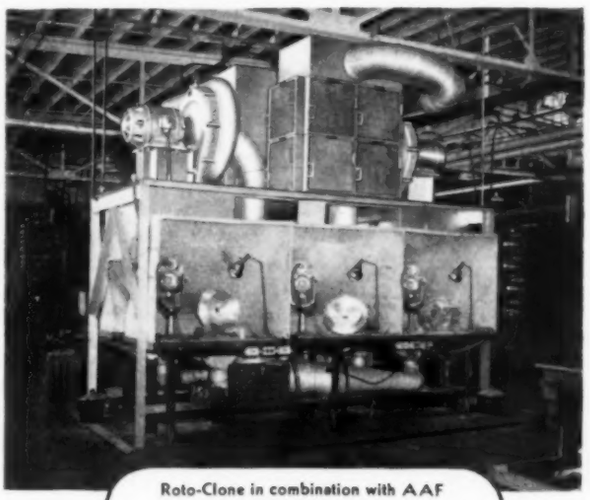

Roto-Clone in combination with AAF filters thru which cleaned air is returned to the workroom.

Roto-Clones like those assembled above for shipment to new industrial buildings and foundries, give some idea of the important part that dust control plays in National Defense. In plants where tanks, planes, trucks, guns and shells—in fact wherever the countless defense materiel are made—clean air plays a vital role in keeping production lines moving at unprecedented speed.

Men who operate machines must breathe freely of clean, wholesome air, and those machines must be protected from the ravages of abrasive dusts that deteriorate the best of equipment or break down accurately finished surfaces.

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AMERICAN AIR FILTER COMPANY, INC., LOUISVILLE, KY.

(*Concluded from page* 124)

heads or risers on the castings are clipped off on a shear. After shearing the castings are cleaned by tumbling in barrels made by the Whiting Corp., Harvey, Ill. The gate fin or projection is ground off, the lot numbers stamped on each shell, and then the shell castings are annealed, or heat treated.

Heat treating is accomplished in two continuous types, electrically heated ovens equipped with controlled atmosphere apparatus. One of the furnaces was built by the General Electric Co. and the other formerly oil-fired, was converted by the Auto Specialties Mfg. Co., into an electrically heated furnace with General Electric Co. units. Capacity of the furnaces will depend upon the heat treating cycle, and for the 9-hour cycle used for the British shells the output is about 35 tons per day while with the 15-hour cycle used for the American shells the output is 28 tons per day.

After heat treatment the shells are cleaned inside and out by abrasive blasting using steel grit. External blasting is performed in four machines supplied by the American Foundry Equipment Co., Mishawaka, Ind., and internal cleaning is accomplished in three special machines also supplied by the same firm. Following cleaning the ends of the shells are clipped square.

Hit Jack Pot

DRILLERS sinking a 6-inch water well on the property of the Auto Specialties Mfg. Co., St. Joseph, Mich., on Sept. 26 struck a natural gas supply that came in with a roar, and with enough pressure to shoot a flame 20 feet into the air before the pipe was capped. The gas supply was struck at 126 feet. The well was capped with difficulty, and a pressure gage attached showed a pressure of 5 pounds per square inch. Geologists and oil well experts are studying the situation to determine the advisability of drilling the well deeper in quest of oil.

The American shells then are placed in a coin press where the end is press-coined for further machining operations. The British shell is straightened in a press. After those operations the shells are given a final inspection as far as the foundry is concerned, and sent to the machine shop for further operations.

Cores for the British shells are blown on two core blowing machines made by Wm. Demmler & Bros., Kewanee, Ill., and placed in a horizontal position on core dryers. Those for American shells are made by hand and turned cut on end on core plates for drying. The cores are dried in a battery of 8 ovens side by side. The ovens constructed by Young Brothers Co., Detroit, are equipped with recirculating heating systems designed and built by the Foundry Equipment Co., Cleveland. After drying the cores are coated by hand with a silica wash except for the ends. They then are placed in a vertical position on a conveyor which carries them to a spraying stand where a further coating of silica wash is applied. Following the spraying operation, the cores pass through a gas-fired tunnel where they are dried thoroughly.

DESIGNED TO BRING IN REMOTE SCRAP

AN EXPERIMENTAL program designed to bring about quick delivery to steel mills and foundries of iron and steel scrap scattered throughout areas of the United States remote from consuming centers was issued Sept. 26 by Leon Henderson, administrator, Office of Price Administration. To accomplish the objective of bringing in an estimated 500,000 to 2,500,000 tons of remote scrap in Florida and eight Western states, the program allows considerably higher shipping point prices for such scrap, and permits consumers to pay greater transportation charges to bring that scrap to their plants.

Specifically, the amendment sets a maximum shipping point price of $12.00 a ton for No. 2 heavy melting scrap in Florida and all states west of the Mississippi River, excepting California, Oregon and Washington. Price differentials above and below $12.00 for other grades of scrap will be those already established for St. Louis.

A separate section defines as "remote scrap" all kinds and grades of scrap, other than railroad scrap, having a shipping point and point of origin within the states of Florida, Oklahoma, Texas, Arizona, New Mexico, Nevada, Wyoming, Idaho, and Montana. It is stipulated that the maximum price of any grade of "remote scrap" delivered to the plant of a consumer may be $5.00 a ton above the top delivered price which he has heretofore been permitted to pay.

In special situations, according to the amendment, consumers may pay even more than the $5.00 extra freight allowance, provided they apply for and obtain permission to do so in advance from the Office of Price Administration.

Nothing in the amendment affects shipping point prices or delivered prices east of the Mississippi River, excepting in Southern Florida. Sellers in certain of the Western States not included in the "remote scrap" areas still will be able to dispose of their scrap in nearby markets within existing ceiling prices.

Text of the amendment follows:

Title 32—National Defense
Chapter XI—Office of Price Administration

Part 1304—Iron and Steel Scrap

Amendment of Price Schedule No. 4—Iron and Steel Scrap

1304.16, Appendix A, *Maximum Prices for Iron and Steel Scrap Other than Railroad Scrap*, of Price Schedule No. 4 is hereby amended:

1. By adding after Subparagraph 3 in Section (b) of Paragraph II thereof the following Subparagraph 4:

"4. In the State of Florida and in all states west of the Mississippi River, excepting Washington, Oregon, and California, whenever the Shipping Point Price of No. 2 Heavy Melting Steel Scrap, as computed above falls below $12.00 per gross ton at any Shipping Point, the maximum Shipping Point Price thereof at such point shall be $12.00, and the maximum Shipping Point Prices for other grades of scrap at such point shall be computed by applying the price differentials established in Paragraph I hereof for St. Louis, Missouri."

2. By striking out, at the end of Paragraph III, the words, "to the consumer's plant", and inserting in place thereof the following words: "to the consumer's plant, except as provided in Paragraph VI herein."

3. Paragraph VI is amended to read as follows:

"VI.
Remote Scrap

(a) *Definitions.* When used in this Paragraph:

1. Remote Scrap means all the kinds and grades of iron and steel scrap referred to in Appendix A and having a Shipping Point and a point of origin within the States of Montana, Idaho, Wyoming, Nevada, Arizona, New Mexico, Texas, Oklahoma, or Florida.

2. The Shipping Point of Remote Scrap is the point from which Remote Scrap is to be shipped, whether to consumer, dealer, broker or other person or persons.

(b) *Maximum Shipping Point*

(*Concluded on page* 128)

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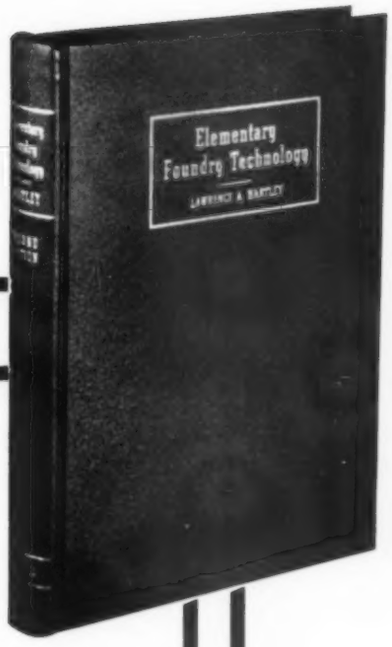

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(*Concluded from page* 126)

Price of Remote Scrap. The maximum Shipping Point Price of Remote Scrap shall be $12.00 for No. 2 Heavy Melting Steel Scrap and, for other grades of scrap, the maximum Shipping Point Price shall be computed by applying to the price of $12.00 for No. 2 Heavy Melting Steel Scrap the price differentials established in Paragraph I hereof for St. Louis.

(c) *Maximum Delivered Price of Remote Scrap.* The maximum price of Remote Scrap delivered to a consumer *wherever located* shall be the Shipping Point Price plus actual transportation charges from the Shipping Point to the consumer's plant as provided in Paragraph III above, *except that*, whenever necessary to absorb transportation charges, the maximum delivered price may exceed the maximum delivered price set forth in Paragraph III above by a maximum of $4.00. Thus the maximum delivered price for Remote Scrap shall be $5.00 above the prices set forth in Paragraph I above, for the Basing Point nearest, in terms of established transportation charges, to the consumer's plant. The consumer, however may not exceed the maximum delivered price provided in Paragraph III above unless he conforms to the reporting requirements of Subparagraph 1. below.

1. No sales or purchases of Remote Scrap may be completed under the provisions of this paragraph unless the consumer of such scrap shall file, with the Office of Price Administration, Washington, D. C., (i) within 10 days following the purchase thereof, a fully detailed statement under oath setting forth the name and address of the seller, the point of shipment of the scrap, the grade, quantity and prices at Shipping Point, delivery price, the name of the carrier, and the transportation charges from the Shipping Point to the consumer's plant, *and* (ii) immediately upon delivery of such scrap, certified copies of all bills of lading covering the shipment of such scrap from the remote area to the consumer's plant. Only reports of purchases and bills of lading involving delivery of not less than one car of scrap need be filed.

2. Where Remote Scrap cannot be delivered to the consumer within the maximum delivered price of Remote Scrap established in Subparagraph (c) hereof, a consumer may apply to the Office of Price Administration, Washington, D. C., for permission to absorb the additional transportation charges necessary to secure such scrap. Applications by consumers must be fully detailed, including an affidavit setting forth the point of shipment of the scrap, the grade, quantity and price at Shipping Point, proposed delivery prices, the name of the carrier, and the transportation charges from the Shipping Point to the consumer's plant. The application should be accompanied by an affidavit from the consumer setting forth its need for, and its willingness to accept, such scrap at the price quoted.

Only applications for purchases which would involve actual delivery of not less than one car of scrap per month from one Shipping Point to one consumer destination will be considered.

The approval of the Office of Price Administratiion shall be obtained before consumers may absorb the additional transportation charge necessary to secure such scrap.

(d) *Termination of Remote Scrap Provisions.* The provisions of Subparagraph 4 of Paragraph II and this Paragraph VI shall become inoperative and terminated on and after December 31, 1941. Deliveries under contracts entered into pursuant to these provisions shall be completed on or before December 31, 1941."

These amendments shall become effective on September 26, 1941.

Copper Scrap Price Schedule Revised

Extensive revision of the copper scrap schedule so as to place ceiling prices on a shipping point, instead of a delivered basis, allow quantity differentials to dealers, and establish premiums for "briquetting" and other special services was made on Oct. 11 by Leon Henderson, administrator, Office of Price Administration. Effective date of the amendment is Oct. 17, 1941.

The original schedule, which was issued Aug. 19, set ceiling prices of 10 cents a pound for No. 1 copper wire and heavy copper, 9c a pound for No. 2 copper wire and mixed heavy copper, and 8 cents a pound for light copper. A uniform dealers' margin of ¾-cent a pound for collecting, sorting, storing and shipping was allowed. These prices were the highest that could be charged for metal delivered to a buyers' plant or warehouse.

As amended, the schedule establishes a single list of ceiling prices at 10 cents a pound for No. 1 wire and heavy copper, 9 cents for No. 2 wire and mixed heavy copper and 8 cents for light copper at the point of shipment and permits the addition of transportation costs to the buyer's plant or warehouse. No special margin is stipulated for dealers' services.

However, excepting for scrap in "crucible shape," dealers may charge a premium of ½-cent per pound on shipments of 40 000 pounds or more

at one time. If delivery is made by truck, a shipment made "at one time" may include all deliveries made to the buyer within a period of 48 consecutive hours. In the original schedule this quantity premium could not be charged by dealers, although it could be collected by makers of scrap.

The amended schedule provides that in the case of No. 1 grade copper scrap sold in "crucible shape," that is, in the form of "briquettes," or in lengths not exceeding 16 inches, cut or bundled a premium of 1¼ cents a pound may be charged. However, no quantity premium may be collected on "crucible shape" scrap. This type of scrap is sold to foundries for use in crucibles and requires special preparation.

Upon application to OPA, according to the revised schedule, a special premium above the ceiling prices may be allowed in the case of copper wire scrap especially selected and prepared for use in the production of copper sulphate or other chemicals, copper powder, or by steel mills, iron foundries, aluminum smelters, etc.

Change Price Rules On Scrap Iron

Authority to import iron and steel scrap from any foreign source at prices exceeding the established maximums will be granted to steel plants and foundries under certain conditions, according to Leon Henderson, administrator, Office of Price Administration.

At the same time, OPA issued an amendment to the scrap shchedule setting up Cincinnati as a basing point for scrap of railroad origin.

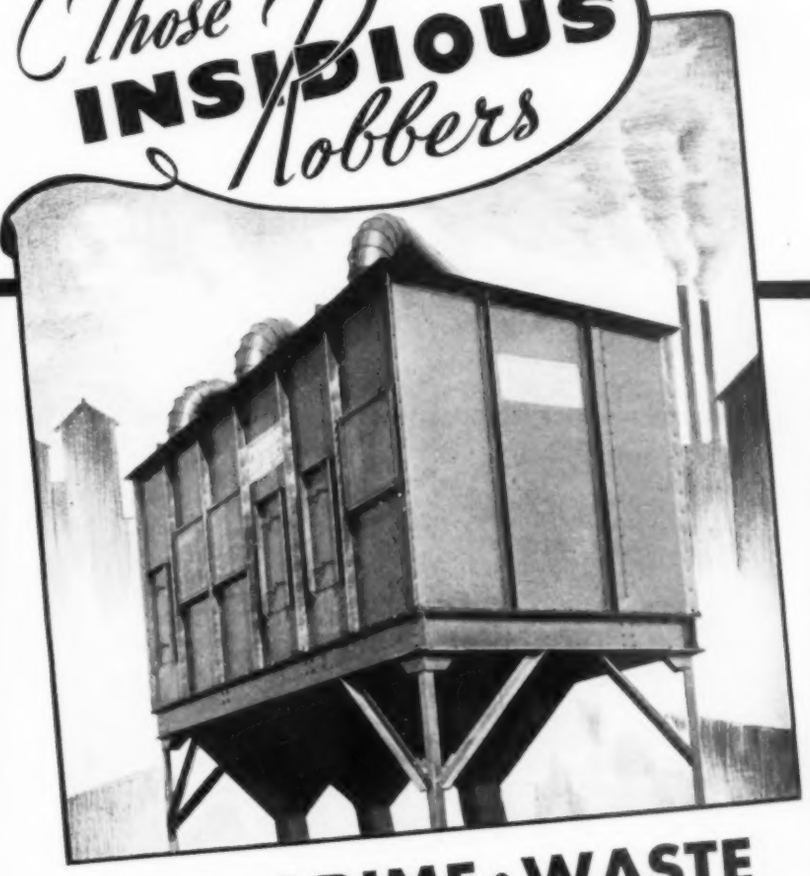
In the case of higher-than-ceiling imports, Mr. Henderson stated, buyers first must apply to OPA for permission, furnishing complete details of the proposed transaction. If authority is given and the scrap brought in, the buyer then must supply OPA with certified copies of the bills of lading.

Inquiries from steel plants indicate that scattered supplies of scrap are available for purchase in Cuba, Mexico and Central and South America. OPA considers it important that United States mills and foundries busy on defense contracts be placed in a position to buy and import this important raw material.

The addition of Cincinnati as a basing point for railroad scrap represents a further refinement of the schedule, and places railroads in that area on a parity with sellers of industrial scrap.

Title 32—National Defense
Chapter XI—Office of Price Administration
Part 1304—Iron and Steel Scrap

Those INSIDIOUS Robbers



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Amendment of Price Schedule No. 4—Iron and Steel Scrap

1304.17. Appendix B, *Maximum Prices for Iron and Steel Scrap Originating From Railroads,* of Price Schedule No. 4 is hereby amended by adding to Sub-paragraph A of Paragraph I thereof the following Basing Point:

Basing Points	No. 1 Railroad Grade Heavy Melting Steel	Scrap Rails	Rails for Rerolling*	Scrap Rails Three Feet and Under	Scrap Rails Two Feet and Under	Scrap Rails Eighteen Inches and Under
Cincinnati, O.	20.50	21.50	23.00	23.50	23.75	24.00

This Amendment shall become effective on the 10th day of October, 1941.

(Executive Order No. 8734, 8875 (6 F. R. 1917, 4483)

Good Flasks Needed

(*Continued from page* 64)

before the flasks finally are fitted so that the pins will fit accurately and the resulting casting produced in them will show no shifts. It also will insure interchangeability of the different flask sections, that is a very vital factor in the production of the highest grade product.

All pins and pin eyes should be drilled in jigs that are maintained at a high degree of accuracy. The jigs should be carefully preserved when they are not in use so that their accuracy will not be distorted. They should be well oiled and placed in some safe location. It is well to standardize in one foundry on a limited number of size of flasks so that a limited number of these drill jigs will be required and a maximum interchangeability of equipment is insured.

The pins on flasks should be strong enough to resist careless blows that might throw them out of line, consequently causing inaccuracy of fit of cope with drag that would mean shifted castings that might even be sufficiently bad to require complete rejection. Small pins therefore are not desirable and should be replaced by substantial strong flask pins fitted accurately into the proper size bushing that will guarantee a minimum clearance between pin and bushing.

Oil the Flask Pins

Clearance, of course, must be sufficient to permit the flask to be operated freely without undue trouble to the molder but at the same time a clearance of only a few thousandths of an inch between pin and bushing should be ample if the centers of flask pins and flask pin holes are maintained accurately by proper use of accurate jigs and the proper maintenance of the equipment by a competent repair crew. Flask pins and flask pin bushings should be oiled carefully with a mixture of lubricating oil and finely ground graphite.

That should be done particularly when not in use so that rusting will not occur during the time the flasks are standing around in the foundry awaiting use by the molder. When flasks are stored in storage sheds they should be well greased on the pins and pin holes and on the matched surfaces that should be maintained accurate by protection against rust and corrosion. Even if aluminum flasks are used the pin hole bushings are usually made of steel and consequently are likely to rust and therefore, should be protected against rust by the proper coating of oil.

It is a fact generally conceded that flasks equipped with two substantial pins of say ¾-inch in diameter or more are more rigid and more accurate in their product than flasks equipped with four small pins of ½ or ⅝-inch in diameter such as one commonly finds in some of the old-fashioned foundries. Such flasks should be scrapped and replaced with modern flasks in the interest of producing a more accurate product that will save raw material, save machining time and save arguments

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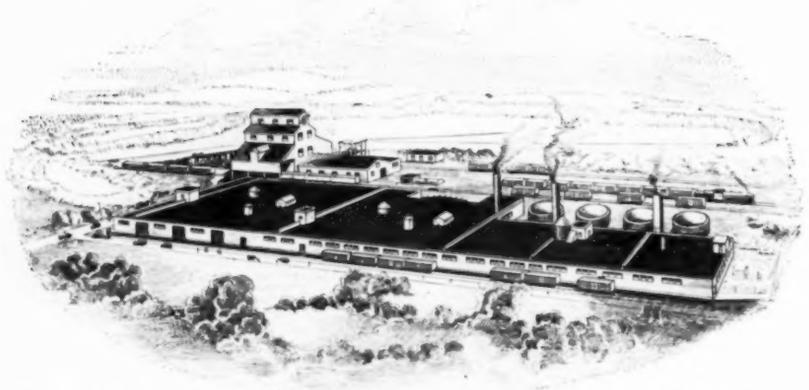

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with the customer or the machine shop.

The advisability of the use of large pins meeting with substantial bushings has been outlined but it should be brought out that such pins must be designed with a substantial shoulder attached to a substantial ear on the flask. Such an ear must be heavy enough to resist springing or distortion under the normal hazards of the rush of production in modern foundries. Without giving actual dimensions we have shown in A of the accompanying illustration a section through a flask showing an ear through which the pin is extended to be tightened to the ear with a nut on a thread at the base of the pin.

It will be seen that this pin has a large square shoulder drawn tightly by the nut against a faced surface on the ear. A like ear on the other half of the mold as shown at B should be drilled and a bushing forced into it. The bushing should be hardened after drilling to the size required to fit the pins. Where a ¾-inch pin is used the bore of the bushing should be 0.75 ± 0.003 to 0.005-inch which would obviously permit sufficient clearance between pin and bushing.

If the pins have been ground accurately to size for interchangeability and a proper amount of taper has been provided for easy entrance such a clearance is ample as long as the pin centers on all flasks are maintained particularly when the ear is of sufficient strength to hold the pins and bushings in proper alignment.

Many people are of the opinion that metal flasks are too expensive or too heavy or both and therefore attempt to make a good product at economical prices with inferior equipment, almost always resorting to wood flasks, many of which are well made at first. Wood flasks, however, after being subject to stress and strains of actual production for a limited number of times are likely to give a good deal of trouble. Repair bills and accuracy of castings produced generally become increasingly troublesome as wood flasks become older, whereas good metal flasks will produce for a very long period of time before giving any trouble at all and with a very minimum amount of maintenance and repair will continue to yield a high degree of product.

Where the objection is that of weight metal flasks may be made of aluminum or other light alloys. Under the present defense conditions, of course, aluminum is not available but metal flasks may be relieved of considerable weight by proper design, by careful thought as to where the metal must be located to give maximum strength, maximum rigidity and still be as light as condi-

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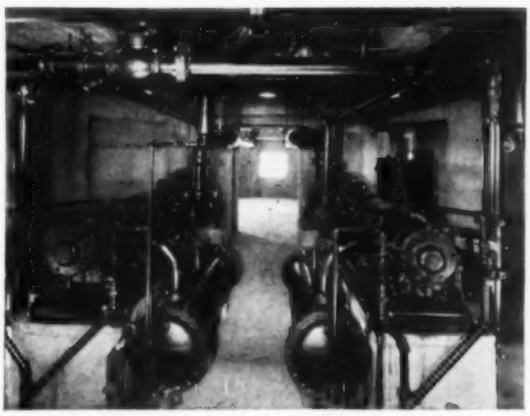

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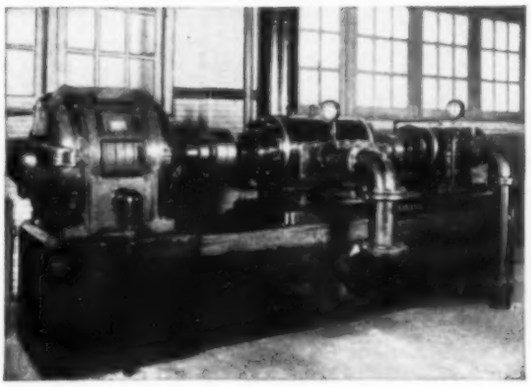

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C-51

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tions will permit. Furthermore the sides of the flask may be full of small holes either machined in them if convenience will permit or they may be cast in when the flasks are made.

Such holes will add to the venting power of the molds when produced, will save metal in the flasks themselves and make a proportional saving in weight. There are on the market a number of excellent cast metal flasks available which are exceptionally well designed to give maximum strength and rigidity with minimum weight. Where foundrymen are designing their own flasks they will do well to provide flasks that are designed by competent engineers who make a proper distribution of the metal therein to give maximum rigidity and strength for a minimum amount of metal therein.

We cannot too strongly emphasize the value of such foundry equipment in the interest of making a high grade interchangeable product, any two castings of which will drop into a jig without undue expense for the removal of fins, excessive metal and the like. This is a factor that will make for efficiency both in the foundry and machine shop as well as in the relationship between manufacturer of castings and the buyer thereof.

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Today one sure way to reduce costs is to cut material handling costs! Raw sand, used sand and castings move faster with far less labor when you use Ajax Lo-Veyors. Foundrymen are using them for short and long hauls, for fixed and variable rates of flow, outdoors and indoors, at floor level, sub-floor and overhead, for level and off-level travel.

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Appoint New Steel Advisory Panel

On Oct. 6, the Office of Price Administration Washington, appointed an advisory panel of twenty members of the carbon steel castings industry. A committee from this panel immediately met with OPA to discuss forthcoming price schedule on carbon and low alloy steel castings. A second meeting was held on Oct. 8. Membership in the advisory panel includes: A. M. Andorn, Penn Steel Castings Co., Chester, Pa.; Carl E. Clarke, Munroe Steel Castings Co., Munroe, Mich.; Harold F. Dunbar, McConway & Torley Corp., Pittsburgh; Cyrus Hankins, Unit-Cast Corp., Toledo, O.; G. W. Harrison, Harrison Steel Castings Co., Attica, Ind.; D. C. Bakewell, Blaw-Knox Co., Pittsburgh.

T. H. Harvey, Ohio Steel Foundry Co., Lima, O.; E. L. Knight, Pacific Car & Foundry Co., Seattle, Wash.; G. T. Johnson, Buckeye Steel Casting Co., Columbus, O.; Oliver E. Mount, American Steel Foundries, Chicago; Frank M. Robbins, Ross-Meehan Foundries, Chattanooga, Tenn.; J. A. Sauer, Symington-Gould Corp., New York; T. H. Shartle, Texas Electric Steel Casting Co. Houston, Tex.; James A. Slater, National Malleable & Steel Casting Co., Cleveland; W. H. Spuehler, Burnside Steel Foundry Co., Chicago; Clarence Tolan, Dodge Steel Co., Philadelphia; Charles P. Whitehead, General Steel Casting Corp., Eddystone, Pa.; Lee C. Wilson, American Chain & Cable Co., Bridgeport, Conn.; W. H. Worrilow, Lebanon Steel Foundry, Lebanon, Pa.

Will Train Youth In Foundry

Advisory committee of the LaSalle county National Youth Administration recently met at the newly opened foundry, Peru, Ill., one of the projects of that organization. Attending were Frank Lang, representing local business, Mary Reardon, LaSalle, Ill., postmistress, Ted Ingles, Streator, Ill., who represented youth. William Huber, superintendent of the NYA foundry and Ralph Tastad, personnel supervisor, also were present. A tour of inspection was made through the foundry by the committee with Mr. Huber acting as guide and showing the various departments which include pattern and machine shops and welding. The committe was impressed with the work carried on and expressed the belief that it is a splendid opportunity for young men.

BY-PRODUCT FOUNDRY COKE PRICES FROZEN AT CURRENT LEVELS

PRICES for by-product foundry coke and by-product furnace coke, important elements of cost in the manufacture of iron and steel products, are frozen at approximately current levels in Price Schedule No. 29 issued Sept. 19 by Leon Henderson, administrator, Office of Price Administration. Only by-product foundry and furnace coke are covered by the present schedule which went into effect on Oct. 1, 1941.

Establishment of ceiling prices on by-product furnace coke and by-product foundry coke follows extensive consultation with members of the industry. The existing price structure, which, in effect, is maintained in the OPA schedule, was stated by the producers to be satisfactory and many of their suggestions as to regional differentials and trade practices have been followed.

In order not to disturb, for the time being, existing relationships between coke producers and foundries using particular grades of coke, the schedule allows prices above the ceiling to be charged under certain conditions. To qualify under this exception the seller (1) must have received from such a foundry a price in excess of the ceiling price during the six months ending September 15, 1941, and (2) must file with OPA on or before September 27, 1941, a list of the foundries to which the exception applies, together with the prices at which past sales were made.

There is considerable doubt as to whether it is desirable to continue this provision as a permanent part of the schedule. The entire matter will be studied by OPA as soon as detailed information on existing relationships of this type has been accumulated.

Any producer or buyer of foundry coke in a position to establish that the exception is causing undue hardship may apply to OPA for relief under Section 1345.6 of the schedule, which provides that "persons complaining of hardship or inequity in the operation of this schedule may apply to the Office of Price Administration for approval of any modification thereof or exception therefrom."

Text of the schedule follows:

Title 32—National Defense
Chapter XI—Office of Price Administration
Part 1345—Coke

Price Schedule No. 29—By-product Foundry and By-product Blast Furnace Coke

By-Product foundry and by-product blast furnace coke are important elements in the manufacture of iron and steel. Maximum prices have been established for pig iron and iron and steel scrap, other important elements of iron and steel costs.

Prices of by-product foundry and by-product blast furnace coke are now from $1.00 to $1.25 per ton higher than a year ago. A further upward movement of coke prices would exert pressure upon the prices of iron and steel. The stabilization of present coke prices is important in the prevention of inflation.

After full investigation and conference with representatives of the coke industry, it has been determined that the establishment of maximum

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LION BINDER - A strong, fast drying paste; tie wires not needed. A strong binder that bakes very fast.

EASY CLEANER CORE COMPOUND - Makes cores that clean out of the castings readily.

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prices for by-product foundry and blast furnace coke is essential and is in the interest of national defense and the public welfare.

Accordingly, under the authority vested in me by Executive Order 8734, it is hereby directed that:

1345.1 *Maximum Prices for By-Product Foundry and By-Product Blast Furnace Coke.* On and after October 1, 1941, regardless of the terms of any contract of sale or purchase, or other commitment, no person shall sell, offer to sell, deliver or transfer, by-product foundry or by-product blast furnace coke, and no person shall buy, offer to buy, or accept delivery of by-product foundry or by-product blast furnace coke at prices higher than the maximum prices set forth in Appendices A and B, incorporated herein as Sections 1345.9 and 1345.10 respectively.*

*1345.1 to 1345.10 inclusive, issued pursuant to the authority contained in Executive Order 8734.

1345.2 *Less Than Maximum Prices.* Lower prices than those set forth in Appendices A and B may be charged, demanded, paid or offered.*

1345.3 *Evasion.* The price limitations set forth in this Schedule shall not be evaded either by direct or indirect methods in connection with a purchase, sale, delivery or transfer of by-product foundry or by-product blast furnace coke, alone or in conjunction with any other material, or by way of any commission, service, transportation, or other charge, or discount, premium, or other privilege, or by tying agreement or other trade understanding, or otherwise.*

1345.4 *Records and Reports.* Every person making purchases or sales of by-product foundry or by-product blast furnace coke after October 1, 1941, shall keep for inspection by the Office of Price Administration for a period of not less than one year, complete and accurate records of (a) each such purchase or sale, showing the date thereof, the name and address of the buyer or the seller, the price paid or received, and the quantity of each kind or grade purchased or sold, and (b) the quantity (i) on hand, and (ii) on order, as of the close of each calendar month.

Persons affected by this Schedule shall submit such reports, to the Office of Price Administration as it may from time to time require.*

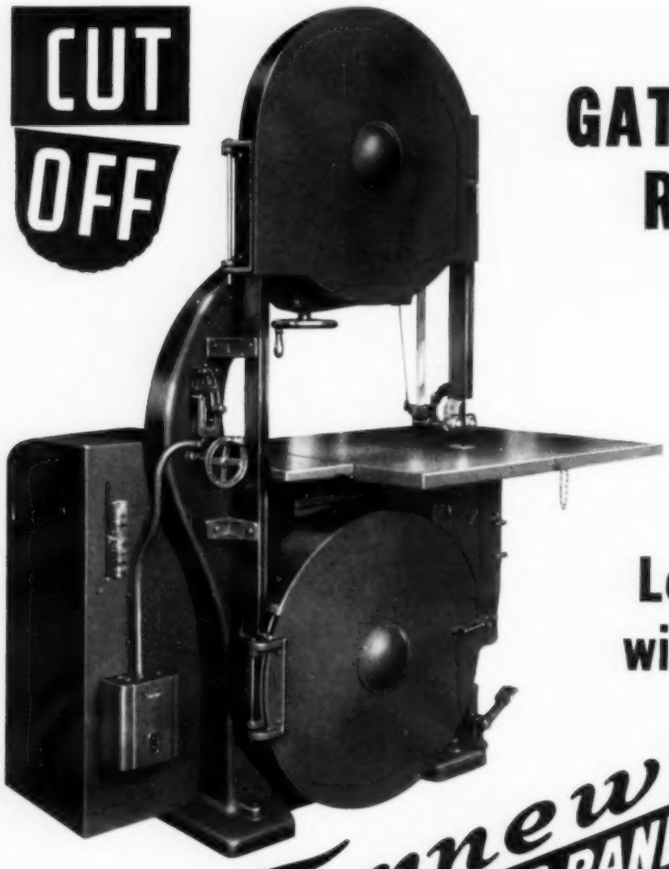
1345.5 *Enforcement.* In the event of refusal or failure to abide by the price limitations, record requirements, or other provisions of this schedule, or in the event of any evasion or attempt to evade the price limitations or other provisions of this Schedule, the Office of Price Administration will make every effort to assure (a) that the Congress and the public are fully informed thereof, and (b) that the powers of the Government are fully exerted in order to protect the public interest and interests of those persons who comply with this Schedule. Persons who have evidence of any offer, receipt, demand or payment of prices higher than the maximum prices, or of any evasion or effort to evade the provisions hereof, or of speculation, or manipulation of prices of by-product foundry or by-product blast furnace coke, or of the hoarding or accumulating of unnecessary inventories thereof, are urged to communicate with the Office of Price Administration.*

1345.6 *Modification of the Schedule.* Persons complaining of hardship or inequity in the operation of this Schedule may apply to the Office of Price Administration for approval of any modification thereof or exception therefrom.*

1345.7 *Definition.* When used in this Schedule, the term "person" means an individual, partnership, association, corporation or other business entity.*

1345.8 *Effective Date of the Schedule.* This Schedule shall become effective October 1, 1941.*

1345.9. APPENDIX A *Maximum*



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THE TANNEWITZ WORKS, GRAND RAPIDS, MICHIGAN

Prices for By-Product Foundry Coke per Net Ton (2000 lbs.)

(a) General Provision

The maximum delivered price for by-product foundry coke shall be the price F.O.B. cars at the governing oven plant, plus rail transportation and switching charges from that oven plant to the place of delivery. The term "governing oven plant" means that oven plant, the price at which, together with transportation charges, results in the lowest price at the place of delivery.

Location of Oven Plant	F.O.B. Oven Plant in Cars per net ton
Alabama	$ 8.50
Chicago	11.50
Ashland	10.00
Detroit	11.75
Kearny, N. J.	12.15
Buffalo	11.75
Ironton, O.	10.00
Painesville, O.	11.25
Portsmouth, O.	10.00
Erie, Pa.	11.75
Philadelphia	11.75
Chattanooga, Tenn.	9.00
Fairmont, W. Va.	10.00
Milwaukee	12.25

(b) Exceptions

(1) *New England Area.*

The maximum delivered price in the states of Connecticut, Rhode Island, Massachusetts, New Hampshire, Vermont, Maine, and in the adjoining areas of New York State which have customarily been included within the New England shipping area, shall be $13.75 per net ton, less $0.15 per net ton discount for cash ten days.

(2) *The Maximum Delivered Prices Within the Following Switching Districts Are:*

District	Delivered Price
Chicago	$12.25
St. Louis, & East St. Louis, Ill.	12.02
Indianapolis	12.00
Terre Haute, Ind.	12.00
Detroit	12.25
Buffalo	12.50
Cincinnati	11.75
Cleveland	12.30
Erie, Pa.	12.25
Philadelphia	12.38
St. Paul and Minneapolis	14.00

(3) *Exception for Certain Existing Relationships.*

Whenever shipment is made from an oven plant other than the governing oven plant and the seller customarily during the six months preceding September 15, 1941, has received from a purchaser a price in excess of the maximum delivered price otherwise established by this Schedule, such higher price may continue to be charged such purchaser. Each person using this exception (3) shall file with the Office of Price Administration, on or before September 27, 1941, a list of purchasers to whom this exception (3) applies and all prices received from such customer during such period. Sales or shipments to customers may not be made under this exception (3) after October 1, 1941, without the filing of such list of purchasers and prices.

(4) *Shipments to West Coast.*

On shipments to the states of California, Oregon and Washington, the governing oven plant may be Chicago, Illinois; Provided, that, when shipment is from the oven plants listed in paragraph (a) of this Appendix, the maximum delivered price may not exceed the F. O. B. oven plant price at such oven plants plus transportation charges.

(5) *Shipments from Swedeland, Pennsylvania.*

Whenever shipment is from Swedeland, Pennsylvania, the maximum delivered price shall be the price provided in paragraph (a) of this Appendix or the price provided in this excetion (5), whichever is lower, except when exceptions (1), (2), (3), or (4) are applicable the prices provided in such exceptions may be charged.

When the railroad freight rate for by-product foundry coke from Swedeland, Pennsylvania to the place of delivery, including switching charges, is:

YOU CAN USE THIS 6-WAY PRODUCTION STEP UP

Costs go down... efficiency up... wherever Transite Core Plates are used. Here's why:

Easier Handling: Made of asbestos and cement, Transite Core Plates weigh only about one-fourth as much as iron and steel of comparable thickness. Operators can handle more plates with less effort.

Stay Clean in Service: Core bonds do not burn into Transite Core Plates, so excess binders and washes are easily removed. When both sides are used alternately the surfaces clean themselves automatically.

High Corrosion Resistance: Being non-metallic, Transite Core Plates are practically unaffected by corrosive action.

Strength: Transite Core Plates are fibrous in nature ... a feature that provides unusual shock-resistance, minimizes cracking and breaking.

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Economy in Service: The surprisingly low prices, low handling costs and long life of Transite Core Plates are bringing greatly reduced production costs to leading foundries all over the country.

MAIL COUPON for prices and details

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Johns-Manville TRANSITE CORE PLATES

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22 East 40th Street, New York, N. Y.
Please send me the facts on Transite Core Plates and prices on plates of the following sizes. No obligation, of course.

.....x.....x..... .....x.....x.....

.....x.....x..... .....x.....x.....

Name_____

Company_____

Address_____

City_____ State_____

Freight Rate per Net Ton	Maximum Price per net ton Delivered
$0.68 and less	$12.38
$0.69 to $0.96 incl.	12.40
$0.97 to $1.66 incl.	12.45
$1.67 to $2.24 incl.	12.70
$2.25 to $2.50 incl.	12.80
$2.51 to $2.85 incl.	12.95
$2.86 and over	10.35*

*F. O. B. Oven Plant, except on deliveries to be made in the Cumberland Valley and Central Pennsylvania, the price shall be $10.00 per net ton, F. O. B. oven plant.

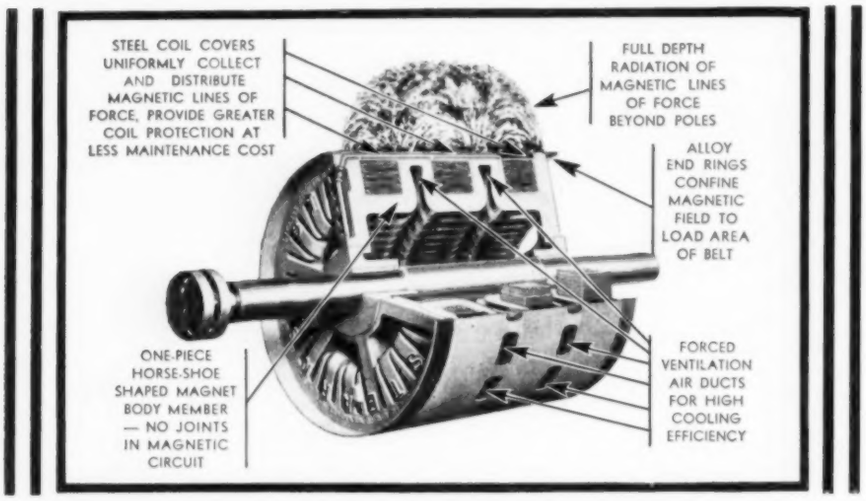
(6) *Delivery Other Than by Railroad.*

When delivery is by means other than railroad, the maximum delivered price shall be the price as computed in this Appendix but adjusted to provide the customary differential or charge in effect on September 18, 1941, for such means of delivery.*

1345.10 APPENDIX B *Maximum Prices for By-Product Blast Furnace Coke per net Ton* (2000 *lb.*)

The maximum price F. O. B. oven plant on by-product blast furnace coke which may be charged by any person at each oven plant, shall be $0.75 per net ton above the weighted average price F. O. B. oven plant of such coke delivered by such person from each oven plant during the first quarter of 1941; Provided, That this Appendix B shall not apply to sales or shipments made after the issuance of this Schedule at less than $6.00 per net ton F. O. B. oven plant. The weighted average price means the average of the prices for which such coke was sold during such period weighted by the tons of such coke sold at each price.

Every person who produces and sells by-product furnace coke shall file prices at which such coke was delivered, and the quantity delivered at each price during the first quarter of 1941. Such information shall be filed with the Office of Price Administration, Washington, D. C. on or before September 27, 1941.


STEEL COIL COVERS UNIFORMLY COLLECT AND DISTRIBUTE MAGNETIC LINES OF FORCE, PROVIDE GREATER COIL PROTECTION AT LESS MAINTENANCE COST
FULL DEPTH RADIATION OF MAGNETIC LINES OF FORCE BEYOND POLES
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Just a few of the many distinctive and exclusive features that make the STEARNS Magnetic Pulley the outstanding value today. With this pioneer designing comes highest quality material, exacting fabrication and exhaustive tests. The wide acceptance of STEARNS Magnetic Pulleys, prestige earned in satisfactory service for outstanding companies everywhere, is the result of progressive better engineering. STEARNS gives most for the dollar.

Offer a positive and economical method of automatically reclaiming iron. Readily installed in your conveying system, there is a size to suit your requirements. A positive time and labor saver. Available also in self contained, mobile units.

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SEPARATORS — DRUMS — ROLLS
CLUTCHES — BRAKES — MAGNETS

STEARNS MAGNETIC MFG. CO.

650 So. 28th Street - Milwaukee, Wis.

Cooling Fan

Electric Ventilating Co., 2850 N. Crawford avenue, Chicago, announces a new 36-inch heavy duty portable floor fan which delivers a blast of air in a straight line. Self contained, completely equipped and ready for any type of installation, it is particularly well adapted for man cooling problems. It can be set up in practically any position to afford relief to men working in heated positions. The unit readily may be moved by truck or crane. The one piece metal, four blade fan is keyed to the motor shaft and is protected by heavy steel mesh guards front and back. The 36-inch unit weighs 675 pounds, runs at 1140 revolutions per minute and circulates air at the rate of 24,000 cubic feet per minute. Guard diameter is 43 inches, base diameter 32 inches, and overall height 67 inches. Other models with the same general features but not of extra heavy construction are available in sizes 12, 24, 30 and 36 inches diameter.

Rubber Belt Idler

Link-Belt Co., Chicago, has designed a rubber-tread, impact troughing, belt conveyor idler for absorbing shock of receiving heavy, lumpy or rough materials at the belt loading point. It is claimed that the cushioning effect of the idler will prevent cutting, bruising, scuffing of the belt, and protect the bearings and framework from shock; prolonging life of both belt and idler. Molded rubber tread-rolls 6 inches in diameter are secured firmly to roller bearing equipped tube by set screws through malleable iron spacers which clamp over reinforced rubber hubs. The new idlers are available for belt widths from 14 to 60 inches. Larger diameter rolls can be supplied as well as rolls for flat-belt conveyor idlers.

ADVANCE FILING TIME FOR PIG IRON

THE eight days provided for in Preference Rating Order M-17, between the filing by pig iron producers of shipment schedules, and their approval or modification by the Iron and Steel Branch, OPM, has proved an insufficient period for proper handling, and an amendment to the order was issued on Oct. 14 by Donald M. Nelson, Director of Priorities. The amendment calls for the filing of reports by producers on or before the 12th of the month, and provides that their return by the Iron and Steel Branch of OPM shall be made on or before the 25th of the same month.

The original order called for filing of reports on the 15th and their return to the producer on the 23rd. A copy of the amendment follows:

TITLE 32—National Defense

Chapter IX—Office of Production Management

Subchapter B—Priorities Division
Part 947—Pig Iron

Amendment to General Preference Order M-17

(a) Paragraph (d)(2) of section 947.1 (General Preference Order M-17) is hereby amended to read as follows:

"On or before the twenty-fifth day of each calendar month, the Director of Priorities, through the Chief of the Iron and Steel Branch, will direct each producer to make deliveries in the subsequent month of pig iron withheld pursuant to paragraph (d)(1) hereof or an equivalent of such pig iron. If any producer does not receive such direction as to any part of such pig iron on or before said date, he may dispose of the same in accordance with other directions of this Order."

(b) Paragraph (e) of section 947.1 (General Preference Order M-17) is hereby amended to read as follows:

"(e) *Customers' Reports and Producers' Delivery Schedules.*

(1) On or before the twelfth day of each calengar month each pig iron customer shall file with the Iron and Steel Branch of the Office of Production Management a report showing supplies, consumption and requirements of pig iron and such other information as may be from time to time prescribed.

(2) On or before the twelfth day of each calendar month each producer shall file with the Iron and Steel Branch of the Office of Production Management a schedule of his proposed shipments of pig iron during the next succeeding calendar month, excluding from such schedule of shipments the pig iron withheld under the provisions of paragraph (d) above. Except as may be specifically authorized by the Director of Priorities, no shipment of pig iron shall be made by a producer unless and until such shipments shall have been scheduled and reported as required by the provisions of this paragraph, and such schedules shall have been approved by the Director of Priorities. Subject to the provisions of paragraph (b) above, pig iron which has been so scheduled by a producer for use in the manufacture of steel may be used for that purpose unless specifically disapproved by the Director of Priorities."

(c) This Amendment shall take effect immediately.

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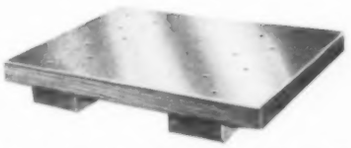
INVESTIGATE THESE CM&D AIDS



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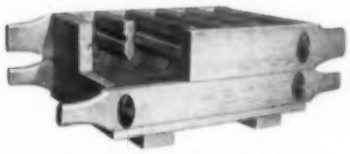
Covered with 3 16" "linasbestos", this special bottom board presents a surface which is practically fireproof. Light weight, long life, low cost. Any size.



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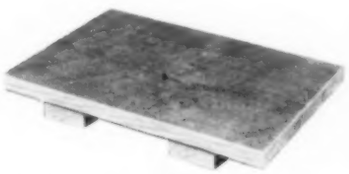
A big seller. Made from best grades of Norway Pine. Completely reenforced for hard use. Pins and guides furnished if desired. Complete with bottom board.



WOOD BOTTOM BOARDS

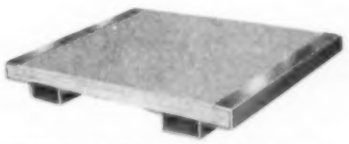
Precision-made to exact size required. Made from select No. 2 Northern White Pine, surfaced to 1-1 4" full thickness unless otherwise ordered. Please specify exact size desired.

COMPOSITION JACKETS

Special composition material is no-burning, non-warping. Light in weight, low in cost. Angle iron corners and handles securely bolted as shown. A trial order will show you.

SPECIAL BENCH FLASKS

For bench, floor or machine work. Sides are tenon cut for insertion of end pieces. Furnished with or without tie rods for bench work. Wood block handles as illustrated.



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Cleats keep board from warping and may be used over and over again. Made from 16-gauge steel, cleats held in position by wood screws. Users praise highly. Specify size required.

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CHICAGO MFG. & DISTRIBUTING CO.

Manufacturers and Distributors of Foundry Equipment

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Obituary

MICHAEL T. SCUDDER, 79, general superintendent, foundry department, Home Stove Co., Indianapolis, died recently in that city. Mr. Scudder had been with the company 58 years.

* * *

Robert V. Good, 50, manager, Philadelphia Works, General Electric Co., since 1936, died Sept. 17, at his home in Drexel Hill, Pa. Mr. Good was born in Germany and attended the Royal Technical School, Stuttgart, graduating in 1911. In that year he came to the United States and obtained employment in Cincinnati. In 1913 he joined the General Electric Co. in the general superintendent's office at Schenectady.

* * *

Harold P. Digney, vice president and general manager, Oberdorfer Brass Co., Syracuse, N. Y., died Sept. 13, from a heart attack.

* * *

Thomas E. Henry, 73, founder and chairman of the board, Henry Furnace & Foundry Co., Cleveland, died Oct. 3 at his home in that city. Mr. Henry founded the Henry & Scheible Co., predecessor of the Henry Furnace & Foundry Co. in 1893.

* * *

James B. Hay, 71, retired industrialist, died Sept. 5 in Orange, N. J. He retired 20 years ago as vice president, Hay Foundry & Iron Works, Newark, N. J., which was founded by his grandfather and since has been acquired by Bethlehem Steel Co.

* * *

Verton Peck Staub, 73, president, New Milford Foundry & Machine Co., New Milford, Conn., died at his home in that city Sept. 12. Mr. Staub had long been prominent in local civic and business activities and at the time of his death was also president of the New Milford Water Co.

* * *

Charles H. Roberts, 51, treasurer, Johns-Manville Corp., New York, died Sept. 10, in that city. Mr. Roberts began his business career with John A. Roebling's Sons Co., Trenton, N. J., in 1907. He joined Johns-Manville Corp., in 1928, becoming treasurer in 1938.

* * *

Henry Buker, 67, vice president, Brown & Sharpe Mfg. Co., Providence, R. I., died Sept. 29. Mr. Buker was graduated from Phillips Exeter Academy and the Rhode Island School of Design. He then spent considerable time in traveling abroad before joining Brown & Sharpe Mfg. Co. in 1892. Upon completion of his apprenticeship training there, he was made assistant foreman. In 1899 he went to Europe, spending a year in Germany and a year in France. Returning to the United States, he worked himself up to assistant secretary and sales manager of the company, and in 1924 was made vice president.

* * *

George Edward Collings, 87, one of the founders and vice president emeritus, Dow Chemical Co., Midland, Mich., died Sept. 24, at his home in Cleveland. Mr. Collings resigned last May as vice president and director of the company, an office he had held since the firm's formation in 1897. Born in England, he was educated at the Clehonger Academy, Herfordshire, England, and as a youth went to Canada, where his first employment was as a field clerk for the old Canada Southern railroad, now part of the Canadian Pacific railways. He went to Cleveland in 1871, where he became a leader in industrial enterprises. In his many years in that city he was a director and officer of many organizations and financial institutions. He was a member of the Cleveland Chamber of Commerce and numerous clubs and societies.

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JIB CRANE

in a HURRY?

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easier with a jib crane

THE wall type jib crane, illustrated, can be quickly and easily installed in your foundry. Equipped with a hand or electric hoist (your own or furnished by us, as you wish), it will handle loads from ½ to 3 tons over a 20 ft. radius. Faster handling of materials means time and money saved—why not check on one or more of these low-cost units for your foundry TODAY? Delivery on wall-type jib cranes in one to two weeks.

CHICAGO TRAMRAIL COMPANY

2910 CARROLL AVE. Phone KEDzie 7475 CHICAGO, ILL.

MELTING QUALITY IRON

(*Continued from page 59*)

and 9 inches long, with a rectangular hole 2 inches high and 1¼ inches wide. This block usually stands up for four to six heats or from 1000 to 1500 tons of metal.

The tap hole is 11 inches and the slag hole 24 inches above the bottom ring. The slag hole is held 7 inches below the tuyere. The well holds about 5 tons of metal.

The cupolas have two large charging doors directly opposite each other; one in front where the iron is mechanically charged and the other in the rear where the coke is mechanically charged.

The components of the iron charge are picked up with electromagnets and dropped into a weighing hopper as shown in Fig. 3. When the charge is completed, a lever is pulled and the charge drops into a charging bucket and conveyed to the charging deck. These buckets have cone shaped lowering bottoms and do a good job of distributing the metal fairly evenly. All of the scales used for weighing the iron and coke are provided with mechanism for registering the weights on a tape which may be inspected at will.

It is all important to follow rigidly a standard practice in cupola operations. It pays well. For instance, through the observance of standard procedures, it is possible to reduce iron-coke ratio on cylinder iron down to about 10 to 1; cold iron at the spout is rare, and melting capacity has been raised to 28 or more tons per hour.

Heap sand is used in the cupola bottom. A green compression strength of 3 pounds, dry strength of 30 pounds, permeability of 50 and moisture of 4 per cent gives satisfactory service. Bottom sand is held closely to these specifications. It is always tested for these physical characteristics before using. The bottom doors are well vented. A measured amount of sand is used for each cupola bed. A portion of the sand is dumped onto the bottom doors, spread around the lining and well tamped.

The remainder of the sand is then dumped in, spread evenly over the entire surface and the whole tamped firmly, especial care being taken around the edge at the lining. The bed is built up at the back with an even slope toward the tap hole with a drop of about 3 inches. By adding a portion of the sand first and tamping around the lining a double safe seal is formed, which eliminates the danger of iron coming through the bottom at this point. The work on the cupola sand beds is started at about 10 p.m.

When the sand bed is finished, wood is lowered by means of a rope and placed over the surface of the sand. The remainder of the wood allotted to this cupola is thrown in, and a sufficient amount is used to assure that the first of the coke added rests above the tuyeres and that a good start is made for the coke bed. This amount of wood is measured by filling a trailer for each cupola. The wood is lighted at 3 a.m. and allowed to burn briskly before the coke is forked in.

All of the coke used in the bed is weighed. It is weighed in two portions known as the first and second bed. The night men fork in the first bed of 3000 pounds. This coke is not added all at one time but in installments as the fire progresses. When all the coke has been added, all drafts are closed and the fire allowed to burn slowly until 6 a.m. The day men come on the job then and following a gentle air blast of 30 inches, the sec-

TRUSCON FOUNDRY FLASKS

time-tested in tough service at Fulton Foundry plant!

Cleveland, Ohio

They're still strong and rigid . . . full of the great durability built into them the day they were formed . . . even after many, many years of heavy production service at the Fulton Machine and Foundry Co., Cleveland, Ohio.

That's because Truscon Foundry Flasks are designed and built to meet the particular requirements of light, medium and heavy casting work. Correct thickness of flask walls . . . proper placing of flanges . . . types of handles and pin lugs . . . these features assure quick, economical, long-life production in your plant.

Write for illustrated catalog giving Truscon Foundry Flask details that may help you increase foundry profits.

TRUSCON STEEL BOXES AND SKID PLATFORMS permit the *efficient storage* of material, and *efficient* movement to production lines. Extremely durable and long-lived. May we study *your* material-handling problem? Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, O. *Subsidiary of Republic Steel Corp.*

TRUSCON FOUNDRY FLASKS

ond bed of coke of 2000 pounds is forked in. The bed is leveled off and measured. If it does not measure up to 55 inches above the tuyeres, sufficiently more coke is forked in to bring the level of the bed to this height. It would have been a much easier and quicker job to have dumped the coke in by means of the mechanical charger, but in order to select the best coke for this purpose and remove all fines, the slower and harder procedure is followed of forking the coke in.

At 6:10 a.m. charging begins. In cupolas producing cylinder iron 6000-pound charges are used. The charges are split up into two sections, each section containing approximately the same silicon content and steel scrap. The first charge is dropped on the coke bed from the mechanical charging bucket and the charge leveled as much as possible with long hooks, especially the steel scrap. 175 pounds of limestone and 6 pounds of soda ash in the form of briquets are scattered over the charge. The first charge of coke is forked in and heaped in the center with a thin covering at the lining. All charges of coke are weighed. When the cupola is filled to the charging door it is ready for melting. The blast on the first cupola is turned on at 6:35 a.m.

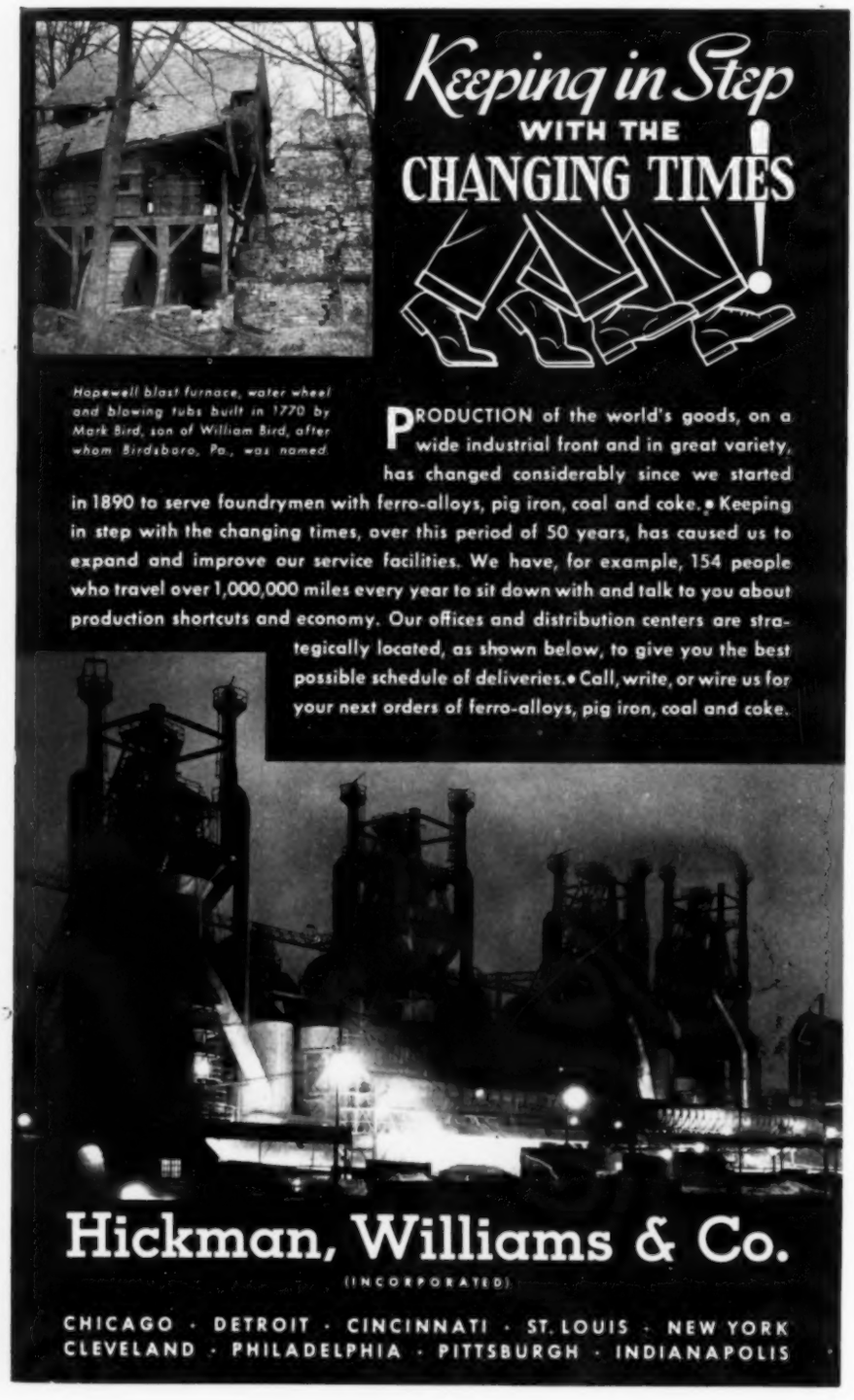
Regardless of the melting rate schedule for the day's heat, the centrifugal blower is started at 850 pounds of air per minute, with an air pressure in the wind box of 20 to 22 ounces. At 7 a.m. the first tap is made; at 7:10 a.m. the weight of air is adjusted to meet the melting schedule required for the day. As fast as the stock sinks down in the cupola new charges are added. If for any reason a delay occurs in the delivery of the charges to the cupola the blast is stopped if the charges drop to 6 feet below the sill.

As previously mentioned the weight of air supplied to the cupola is adjusted to meet the casting production schedule. Practice calls for melting at a slightly higher rate than is required to keep the cupola wells filled at all times. Intermittent tapping is practiced, which adds to the problem of keeping the wells filled. Slag disposal is accomplished by means of a long trough passing along the rear of the battery of cupolas, which has a stream of running water and a conveyor passing through it. It is important, for obvious reasons, that no iron be allowed to run into the trough, although a by-pass is provided to divert any iron that does flow from the slag hole.

Amount of Air Measured

It is the practice never to increase or decrease the quantity of air, and this is only done when for some reason the casting schedule has been changed for a period of an hour or more. A daily casting schedule for the following day is supplied and from this it is possible to determine the amount of air to use for the following day. At the present time the cylinder iron schedule calls for an average of 25 to 26 tons per hour per cupola for 9½ hours duration, or a total tonnage for each cupola of 225 to 250 tons.

As the tonnage during the first hour, the noon hour and the closing hour are considerably less than this figure, the actual melting rate during the remaining 6 or 7 hours is 28 or 30 tons per hour. Toward the end of the heat, a check-up is made of the amount of iron required, and charging stopped at the right time so that no large amount be left over to pig or to drop unmelted when the bottom doors of the cupola are dropped. The cupola holds about 20 tons of metal, including the molten iron in the well. It is surprising how close the estimates agree with the actual amount in the cupola, requiring


Keeping in Step
WITH THE
CHANGING TIMES!
Hopewell blast furnace, water wheel and blowing tubs built in 1770 by Mark Bird, son of William Bird, after whom Birdsboro, Pa., was named.
PRODUCTION of the world's goods, on a wide industrial front and in great variety, has changed considerably since we started in 1890 to serve foundrymen with ferro-alloys, pig iron, coal and coke. • Keeping in step with the changing times, over this period of 50 years, has caused us to expand and improve our service facilities. We have, for example, 154 people who travel over 1,000,000 miles every year to sit down with and talk to you about production shortcuts and economy. Our offices and distribution centers are strategically located, as shown below, to give you the best possible schedule of deliveries. • Call, write, or wire us for your next orders of ferro-alloys, pig iron, coal and coke.
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very little pigging or large drops.

Daily repairs to the cupola lining are confined to the melting zone, breast and slag hole. With present heats the burning out in the melting zone is not so severe as to require a complete new installation of cupola block or firestone. Following the first heat the lining usually is patched up with a ganister-clay mixture and fire brick, extending as far up as is necessary to bring the diameter back to the original dimensions. After the second heat has been run it is generally necessary to rebuild the melting zone. The lining is started out with one row of cupola block on the upper tuyere plates. The next three rows are made up of firestone, imbedded in the ganister-clay mix; care being taken not to have these blocks too closely packed. In fact a space of from ½ to ¾-inch is held on all sides of the blocks, filled in with the daubing mixture. Above the fire stone 9-inch straights and splits are used to taper off the repair zone.

The slag hole block is usually good for 4 to 6 heats, and is removed when the hole has become so large that there is some doubt as to whether it would last for another heat. The interior face of the block is protected each day with a build-up of fire brick, which partially accounts for the long life of the block. The "A" tap hole block is replaced daily; this is a simple installation and does not require a complete new construction of the breast. The "B" block remains in position for possibly one week.

Many ladles, of three different types, must be repaired. They range in capacity from 20 to 1800 pounds. Type 1, the most commonly used ladle, has the round flat bottom and flared sides. Type 2 is the barrel shaped ladle, and type 3 is a small ladle made in the foundry and used for a special job. Most of the ladles of the first type have a capacity of 1800 pounds and are used to distribute the iron from the cupolas to the pouring units, and are attached to and carried over-head on electric cranes.

It is obvious that a very safe lining must be used in these ladles. In the bottom a ganister-clay ladle mixture is rammed in about 1 inch thick, upon which is placed a tile disk, sufficiently large in diameter to cover the entire bottom with an open space at the side of about ½ inch which is rammed in with the ganister mixture. The sides are rammed about 1 inch thick with the ganister mixture and fire brick or firestone splits are imbedded in this lining, thus providing a safe and durable lining. The barrel ladles are rammed with a monolithic lining of the ganister mix.

The ends have an insulated rammed lining with the tele disks imbedded in. Almost all ladles are made with spouts extending to the bottom of the ladle. The lining material is made of 75 per cent ganister sand and 25 per cent fireclay with a moisture content of 5 per cent. The third type, is of small capacity—20 lbs.—is made with an air-setting refractory capable of withstanding considerable mechanical shock. The crane ladles carry on an average, about 80 tons daily, and hold up for a period of two to three weeks and have handled from 1000 to 1500 tons of metal. All of the ladles must be chipped out each night and the lips and tops repaired daily. For this purpose the ganister-clay mixture has a liberal amount of molasses or other organic binder added.

Careful control of the chemical and physical properties of the iron is essential. The remark has been made to the author, that once the proper mixture and chemical composition has been attained and with proper cupola practice, one should be able to forget about metal control. His answer to that was, that it is about as feasible to do that, as it is for an automobile driver to start his

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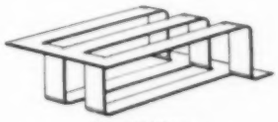

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car in the right direction on a straight road, take his hands off the steering wheel and let her go.

Why is it that the car will not continue in the straight path? The car is all right, but it is the variables that enter into the picture. The same is true of cupola melting. It is a never ending job to control the variables. There are six important features which are watched closely in an endeavor to obtain a uniform and satisfactory iron. These are, chemical composition, fracture, chill depth, hardness, fluidity and temperature.

Control of these generally takes care of all that is required of the iron. Uniform composition is obtained through the proper blending of raw materials and cupola operation. It is controlled by means of chemical tests and in the cupola charging practice. Carbon determinations are made every half-hour and silicons every hour; sulphur, phosphorus and manganese, daily. Proper cupola operation is one of the most important items in the control of the composition and physical properties, and also the hardest to attain and hold.

The difficulty in this case is due largely to the amount of carbon absorption by the iron and the gain or loss of silicon due to slag reactions, velocity of air, variation in composition of raw material, etc. The amount of carbon absorbed by the iron is dependent upon many variable conditions, namely, velocity of air, quality size and composition of the coke, weight and bulkiness of the metal charge, time interval that molten iron remains in contact with the coke in the well, temperature of the metling zone, fluidity and composition of the slag, and variation in the height of the coke bed.

Other causes of the variation in the composition of the iron, especially the silicon content, is due to improper charging, in which the steel is not uniformly distributed through the charge, differences in the melting ranges of steel, high silicon pig, and cast scrap, and the lack of circulation and mixing of the molten metal in the well. Some of these causes for variation in the composition which have been mentioned, such as the difference in the melting range of the several ingredients which make up the charge and lack of circulation of the molten iron in the well, constitute a real problem for the foundry metallurgist.

Will Reduce Variations

One answer is a mixing ladle or hearth, or development of a charging technique that will reduce the variation to a minimum, in conjunction with the proper sizing of raw materials entering the charge. An example of sizing, is the crushing of cylinder blocks and the rejection of large chunks of steel and iron weighing over 100 lbs. Another thing to watch is the composition of the scrap materials.

One may run into an epidemic of jumping up or down of one element in the iron, say silicon. In one case of this trouble a systematic study based on the elimination of one constituent in the iron mixture in one cupola and an increase of the same ingredient in a second cupola producing the same grade of iron, proved that a certain material, namely cast iron borings, was the cause of this trouble.

Probably of more importance to the machine shop than the close control of composition is the regulation of the depth of chill or the chilling tendency of the iron. Chilled spots, chilled corners, etc. in castings are not entirely dependent on the iron alone. The foundry practice, especially the proper location and size of gates, pouring temperatures, composition and permeability of molding sand, moisture in the sand, etc. are very important and must be taken into consideration in the elimination of chills.

However, this phase of the subject is not within the scope of this article. We are concerned here with

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the chilling tendencies of the iron. It is believed by most gray iron foundry metallurgists, including the author, that iron of exactly the same chemical composition, but on account of the source of the ores, blast furnace practice and cupola operating conditions different chilling tendencies may be acquired.

Generally, though, this chilling tendency has been closely related to the composition of the iron, especially with the carbon and silicon content. The first essential, therefore, is to endeavor to produce an iron of regular chill depth by means of good cupola practice. The author regrets to say that he has never been able to achieve this acme of perfection and resorts to speedy chill test control methods. Two types of chill test bars of different size and section are used and shown in Fig. 6. One, the larger size, has the shape of a section of a milk bottle only of course, much smaller.

Make Special Test Blocks

That test piece is 6 inches long, 2 inches high, 1 inch thick in the bulge and ½ inch thick at the chilling surface. The second chill test piece, with an icosceles triangular section, is 4 inches long, ¾ inch high with a base of ½ inch. Both of these shapes are formed in cores as shown in Fig. 4. The larger one is poured against a chill, whereas the smaller one depends upon mass and the sharpness of the angles of the test piece to produce the chill. These bars have both proved very useful, and neither one is complete in itself.

The larger bar cools too slowly for quick results but is useful for other purposes than just a measure of the chill. The smaller bar is poured, quenched, broken and examined, all within a period of 25 seconds, and is useful in determining the trend of the metal and what ladle additions may be necessary to lower the chill, if the depth is on the high side. For the reduction in the chill, graphite and ferrosilicon are used. We very seldom use more than a pound and usually about ¼ of a pound when necessary, to 1800 lbs. of iron. We find that 0.007 per cent or one part of graphite to 14,400 parts of iron has an appreciable effect in reducing the chill. It is very evident from the above figures that the action depends upon something entirely different than just the increase in the per cent of carbon.

This is the first of two articles from a lecture presented by the author at a foundry course sponsored by the Detroit Chapter of the American Foundrymen's Association. The second will appear in an early issue.

THE EDITORS.

Werner G. Smith, 134 Royace avenue, Toronto, Ont., plans a plant addition to cost $90,000 for production of foundry core oil.

Minimum Wage for Jobbing Foundries

Gen. Philip B. Fleming, administrator, wage and hour division, U. S. Department of Labor, approved a recommended 40 cents an hour minimum wage for the gray iron jobbing foundry industry on Oct. 1, which will be put into effect Nov. 3. The recommendation was unanimously made by a committee representing the public, and the employers and employes in the industry, under the chairmanship of Sidney E. Sweet, dean of the Christ Church Cathedral, St. Louis. The 40-cent minimum, it is claimed, will increase the wage rates of about 14,000 of the 175,000 workers in the industry.

Booklet Available

"Fatigue of Metals, Some Facts for the Designing Engineer," is the title of a 45-page booklet recently issued by the Nitralloy Corp., 230 Park avenue, New York. In addition to the text material, there are numerous charts and an extensive bibliography. Copies are available on request to the organization.

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ADDING ALLOYS TO GRAY IRON

(*Continued from page* 63)

carbon, causing these areas to be the last to graphitize. The time at 1400 degrees Fahr. was too short to produce complete graphitization in any of the irons, so the most stable carbides persisted. The chromium iron (No. 2) and the chromium-molybdenum iron (No. 8) show the least amount of carbide spheroidization after annealing at 1400 degrees Fahr. for 1 hour. See Figs. 14 and 13.

A recent publication[8] dealing with the effects of alloying elements on the tempering of pure hypereutectoid steels compares the influence of several elements on the rate of softening of martensite produced by quenching steels containing 1.10 per cent carbon. Part of the second conclusion is presented here.

In the alloys containing approximately 0.5 per cent added element, data obtained at the end of the short tempering period of one hour at all tempering temperatures indicate that manganese, silicon, aluminum and copper show a hardness number from 10 to 30 brinell units greater than the plain carbon steel. Nickel shows no apparent effect whereas chromium exhibits a resistance to softening which is profoundly different from that of any of the other alloying elements investigated. Thus, after one hour at 1020 degrees Fahr. the chromium steel is about 100 brinell units harder than the carbon steel and even after one hour at 1310 degrees Fahr. this difference is 70 brinell units.

Since the spheroidization of martensite and pearlite involve the same fundamental factor, diffusion of the carbide phase, the ability of chromium to retard carbide diffusion is substantiated and the foundryman may depend upon chromium to stabilize the as-cast structure at elevated temperatures. Additions of some of the other elements in combination with chromium have been found to increase this stability.

Various Fields Limited

Boyles[7] has shown that ferrite, austenite and graphite exist within the range of temperature between 1450 and 1550 degrees Fahr. for cast irons of approximately the same carbon and silicon contents as the base iron used for the experiments conducted for this investigation. Fig. 16 is reproduced from his work and shows the limits of the various fields of equilibrium involved in the heat treatment of cast iron. For irons of this general analysis the maximum temperature at which an iron may be graphitized completely is 1450 degrees Fahr. Above this temperature the three phase region or so-called *pearlite interval* is attained.

As indicated, at the lower temperature limit of this field, the iron will consist of ferrite and graphite, if equilibrium is obtained, and, as the temperature rises, carbon (from the graphite) is redissolved in austenite, the quantity of austenite increasing as the temperature rises. At the upper temperature limit of the three phase region the iron will consist of austenite and graphite. Above 1550 degrees Fahr. the iron consists of austenite and graphite and the quantity of carbon dissolved in the austenite will depend upon the temperature as indicated in the diagram.

After the iron has been held at temperatures below 1450 degrees Fahr. the rate of cooling from this temperature will have little effect except insofar as a sojourn at these temperatures is increased as the cooling rate is decreased. However, when the irons are heated to temperatures within the three phase region some austenite is produced and the cooling rate will partially

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determine at what temperature the austenite will transform and thus have some influence upon the final hardness of the iron.

Within the three phase region, graphitization is rapid due to the higher temperature, but complete graphitization cannot be accomplished due to the equilibrium which is finally obtained between the three phases: austenite, ferrite and graphite. The more austenite that is formed while the iron is within this region, and the greater is the stabilizing effect of the alloy additions upon the austenite, the greater effect will cooling rates have upon the final hardness and microstructure of the iron.

A study of the curves shown in Figs. 4 and 7 in the October issue indicate a change in slope of the curves between 1400 and 1500 degrees Fahr. Had tests been conducted at 1450 degrees (between the other two values) the curves would undoubtedly have shown the change of slope originating at that temperature. However, the temperature 1500 degrees Fahr. is well within the three phase region and the presence of austenite at that temperature has been manifested by hardnesses higher than would be expected if the curves had continued at the same slope. Several of the irons exhibit actual changes of direction at 1400 degrees Fahr.; the chromium-nickel iron, No. 11; the chromium-nickel-molybdenum iron, No. 12; and the nickel iron No. 3.

Alloys Affect Transformation

These irons having higher hardnesses after annealing at 1500 degrees Fahr. than they exhibited after annealing at 1400 degrees Fahr. indicate the effects of the alloy additions upon the rates of transformation. It will be noted that these three irons contain nickel, which is known to lower the critical temperatures for steel. It is altogether likely that the nickel lowers the whole 3-phase region, causing more austenite to be formed at 1500 degrees Fahr. than is formed in the other alloy irons whose critical temperatures are not greatly affected. The greater quantity of austenite formed, and the stabilizing effect of the nickel on austenite, tend to raise the hardnesses of these irons at the cooling rate developed by the furnace in cooling from 1500 degrees Fahr. to room temperature.

Except for the chromium iron, No. 2, and the chromium-nickel-molybdenum iron, No. 12, the irons showed lower hardnesses after annealing at 1600 degrees Fahr. than at 1500 degrees Fahr. The matrices of the irons should have been completely austenitic at 1600 degrees Fahr. Under the conditions of the experiments, the furnace (a large muffle furnace) was brought up to 1600 degrees Fahr. and held at that temperature prior to the time the specimens were inserted, so when the power was shut off, the furnace would have a slower cooling rate than it would have from only 1500 degrees Fahr. and the austenite would, therefore, start to transform at a higher temperature, producing softer products.

It is likely that in most of the irons ferrite was precipitated from the austenite during the slow cool through the three phase region. Irons No. 2 and No. 12 evidently contained sufficient alloy content to stabilize the austenite to such an extent that even on the slow furnace cool only a small portion, if any, of the austenite transformed to ferrite upon cooling through the three phase region. The copper-chromium-molybdenum, No. 14, chromium copper, No. 13, chromium-nickel, No. 11, and molybdenum, No. 4, irons showed only a slight loss in hardness when annealed at the higher temperature.

Tensile strengths of the different irons after drawing them to a common hardness of 207 to 217 brinell present some interesting possibilities. Without alloy additions, cast irons of 3.25 per cent carbon seldom

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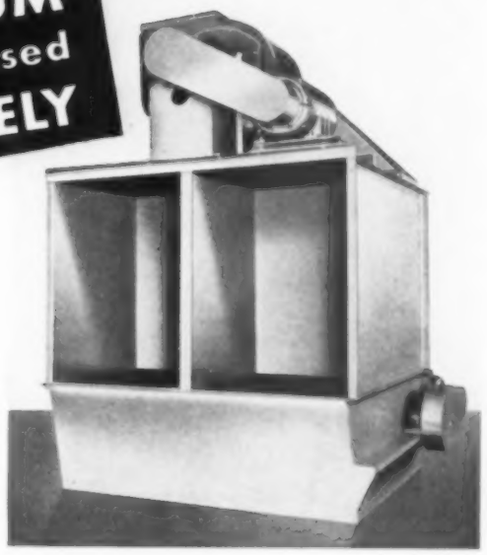

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exceed tensile strengths of 38,000 pounds per square inch. When alloy additions sufficient to raise the strength to 45,000 to 47,000 pounds per square inch are used, the brinell hardness is increased appreciably and machinability is decreased. However, by proper additions of alloys, castings may be produced which, when drawn to a brinell hardness of 207 to 217, will possess tensile strengths of 45,000 to 47,000 pounds per square inch and still be readily machinable. Three of the irons used in this investigation offer this possibility: The molybdenum-vanadium iron, No. 10, the chromium-molybdenum iron, No. 8, and the chromium-nickel-molybdenum iron, No. 12.

It is recognized that by additions of certain inoculants, irons of 3.00 per cent carbon and 1.50 per cent silicon and no alloying elements can be produced which, as cast in limited sections such as B-test bars, 1.2 inch diameter, possess tensile strengths of 50,000 pounds per square inch with brinell hardness of 207 to 229. However, the carbon is lower than for the alloy irons under consideration, a factor which would give the former a decided advantage as far as strength is concerned.

The strengths of these irons will decrease rapidly with increase in section size since there are no alloys to retard the transformation rates of the austenite. As the section size increases, the cooling rate is decreased and the austenite transforms at higher temperatures, producing coarse (lamellae) pearlite and lower strengths. The alloyed irons will not suffer as rapid reductions in strength with increasing section size due to the ability of the alloying elements to stabilize the austenite.

To obtain irons with only 3.00 per cent carbon and 1.50 per cent silicon, using an inoculant often requires considerable changing in regular cupola practice and therefore it is not readily adaptable to use in the regular jobbing foundry when special castings are required. Alloy additions to the ladle used to improve the characteristics of the regular base iron require no changes whatever in practice and are simply accomplished.

Examine the Specimens

In order to provide a basis to determine why different alloy irons containing the same total carbon and graphite distributions as a plain iron will, when drawn to the same brinell hardness, possess superior tensile strengths, metallographic specimens of two other tensile specimens were examined; the molybdenum-vanadium iron drawn to 217, having a tensile strength of 47,000 pounds per square inch, and the nickel-molybdenum iron drawn to a brinell hardness of 212, having a tensile strength of 42,600 pounds per square inch.

Figs. 10, 12 and 15 provide a comparison of the microstructures of these irons with that of the plain cast iron in the as cast condition. The plain iron as cast possessed a brinell hardness of 217 so it was not drawn; hence it contains the pearlitic matrix. The other two irons consist of matrices developed by spheroidizing the cementite lamellae of the pearlite by annealing or drawing at 1225 degrees Fahr. for 1 hour.

The strength of a section of cast iron must depend upon the quantity of graphite present, the size, shape and distribution of the graphite flakes and upon the properties of the matrix. Since the characteristics of the graphite distributions are similar in all of the irons, the differences in tensile strength must result from differences in the characteristics of the matrices. The ability of the matrix structure to resist rupture under tensile stresses when broken up by graphite flakes, depends upon its hardness and its ability to distribute stresses.

Each graphite flake acts as a

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stress raiser, producing stress concentrations at its extremities. A matrix which has the best characteristics of good ductility, coupled with high hardness, should produce the highest strength in a gray cast iron of a given graphite distribution. If two matrices have the same hardness but the distribution of the carbide phase is different, then differences in the mechanical properties of the two irons may be expected to occur.

In an investigation recently conducted by the authors[5] it was found that quenched and drawn structures produced higher strengths than the as cast structures even though the hardnesses were the same. This was shown to be true for six irons varying in alloy content. In every case the quenched and drawn matrix structure was composed of spheroidized carbides in ferrite while the as cast structure of the same hardness essentially consisted of lamellar pearlite.

Illustrates Differences

Fig. 17 reproduced here from *Functions of the Elements in Steel*[9] illustrates the differences in tensile characteristics exhibited by the lamellar and the spheroidized types of carbide dispersions at the same hardness. Note the greater breaking stress and higher ductility exhibited by the spheroidal structures at the same hardness. The actual breaking stress (calculated from the load at breaking and the cross sectional area sustaining this load) is more important to the study of the effects of the different structures in cast iron than the so-called ultimate strength which is calculated from the load at breaking and the original diameter of the gauge length of the cylindrical test bar which is employed.

The following pertinent quotation has been taken from the same book:

> The significance of greater reduction of area is this: at the same hardness, the steel with the spheroidal carbide dispersion is still capable of greater plastic flow even under the adversity of its considerably greater notch effect at the zone of local constriction.

Although that statement refers to the tensile test on a specially prepared cylindrical tensile specimen, it may well apply to the ability of the spheroidal structure to distribute stresses more uniformly in the presence of the notch effect created by the graphite flakes, and thereby increase the strength of the cast iron.

These data readily explain why the alloyed irons drawn to lower hardnesses than they possessed in the as cast condition, an operation involving the spheroidization of the carbide lamellae, exhibit higher strengths than the pearlitic, unalloyed cast iron in the as cast condition and at the same hardness.

While this investigation determined the effects of the various alloy additions on the properties of a gray cast iron of approximately 3.25 per cent carbon and 2.00 per cent silicon, the same general effects or improvements should be realized in making these additions to other gray cast irons of higher or lower carbon contents, the chief difference being the properties of the base iron to which the additions are made and upon which the effects will be produced.

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This is the second and concluding article on effect of alloys on gray cast iron. The first article appeared in the October issue.

THE EDITORS.

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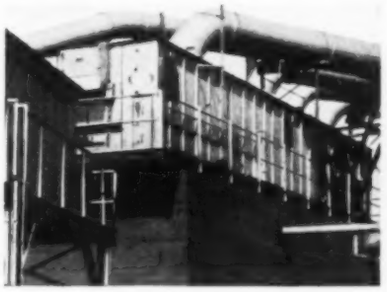

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(*Continued from page 65*)

scription of these x-ray units and their uses follows:

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Shows Structural Details

Fig. 2 is a microradiograph of a cast aluminum alloy showing exceptional details of the dendritic type of structure. The method used consists of preparing a thin section of the metal, placing this sample in contact with a special photographic plate and exposing to low-voltage x-ray radiation—from 5000 to 20,000 volts. The resulting photographic image, which depends upon the varying absorption of x-rays by different parts of the sample, is enlarged up to magnifications as high as 500 times.

2. Three low-voltage units are available for the examination of magnesium and small aluminum castings. Two of these units are portable and can be moved around the plant if desired.

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4. A 400-kilovolt x-ray unit is maintained for the examination of experimental steel castings. This unit is sufficiently powerful when used with steel sections up to 3 inches to use a simplified lead filter technique which requires a minimum amount of time and labor.

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availability of simplified commercial models was welcomed as offering the greatest advance in x-ray technique in the last decade.

The Ford Motor Co.'s interest in the purchase of one of these million-volt units is perhaps a little unusual. Besides using this unit for its technical advantages in the examination of heavy individual castings or weldings, certain features are used which make it ideally suited for the semi-mass production examination of heavy steel castings.

National defense efforts in securing large quantities of heavy defense units such as heavy bombers, tanks, and trucks, naturally put a severe strain on the forging capacity of the steel industry. The Ford company has pioneered in suggesting the replacement by cast steel parts of certain forgings, wherever substitution is found to serve the purpose adequately. The obvious advantages of castings over forgings are their adaptability to mass production and the frequently large savings in machining costs.

New Machine Saves Time

Certain comparisons are offered on the x-ray examination of heavy cast steel parts using the new million-volt unit. Consider, for example, the mass production of a cast crankshaft for a 2000-horsepower aircraft engine. X-ray examination of 40 crankshafts per day on previous units of 400-kilovolt capacity, and using the time consuming "blocking" method to eliminate scattered x-rays, requires 6 times as many man-hours as is found necessary with the million-volt unit.

Fig. 1 shows the extensive pre-exposure blocking work necessary on an experimental cast crankshaft being x-rayed with the 400-kilovolt unit. Experience has also shown that a 2 per cent gage sensitivity is all that could be obtained with the 400-kilovolt unit on this piece, while better than 1 per cent sensitivity can be obtained with the million-volt unit. In addition, no "blocking" methods are required.

Another example, in the tests conducted on a heavy part destined for a large bomber: A minimum of 6 exposures per casting is required on the 400-kilovolt machine, but the million-volt unit is capable of x-raying 6 entire castings at one exposure. Direct comparisons of films on identical castings containing small defects were made with the 400-kilovolt unit and the million-volt unit.

Superiority of the films obtained with the million-volt unit over those produced with the 400-kilovolt unit can be attributed in a large measure to the reduction in x-ray back scatter and to the use of a greater distance from x-ray source to film. The use of greater distances between the x-ray tube and the object being x-rayed is possible because of the extremely efficient production of x-rays in the million-volt unit, allowing a sharpening of recorded detail and a reduction of image distortion.

This article is from a paper presented by the author at the Million-volt, Industrial X-ray Symposium held by the General Electric Co., Schenectady, N. Y., on Oct. 7.

THE EDITORS.

A.F.A. Convention

(*Continued from page* 57)

International Nickel Co., Detroit, Mich.

Malleable Castings—Chairman, C. F. Joseph, Saginaw Malleable Iron Div., General Motors Corp., Saginaw, Mich.

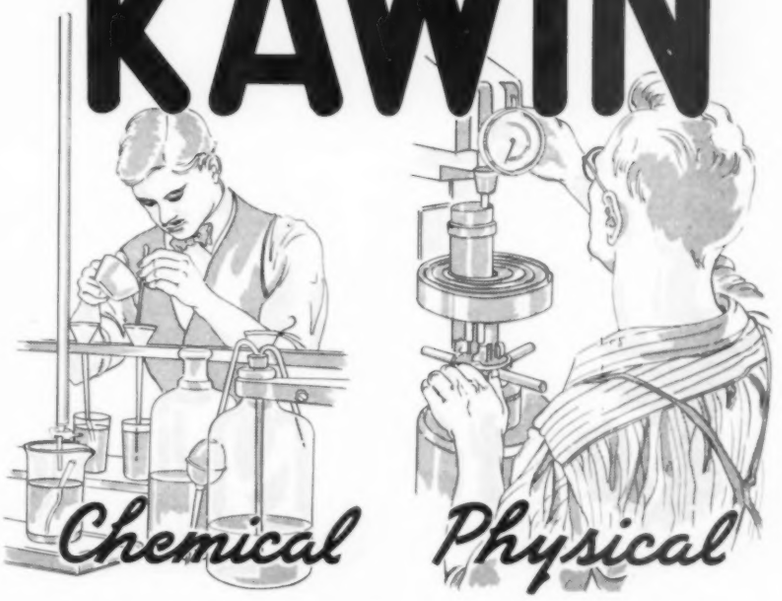
Nonferrous Castings — Chairman, M. V. Healey, General Electric Co., Schenectady, N. Y.

Patternmaking—Chairman, Frank C. Cech, Cleveland Trade School, Cleveland, O.

Steel Castings—Chairman, T. N. Armstrong, International Nickel Co., New York City.

Department of Labor, State of Illinois, 205 West Wacker drive, Chicago, has published technical paper No. 2 entitled, "An Improved Air Sampling Device for Field Work."

KAWIN



LABORATORY SERVICE

ACCURACY, rapidity, and reasonable cost characterize Kawin Metallurgical Laboratory Service to foundries. Available in unit or agreement basis, as you prefer, we invite your inquiries regarding the manner in which your physical and chemical testing can be performed. Typical of some materials regularly tested for foundry clients are these:

Irons	Aluminum	Coke, Coal	Minerals
Steel	White Metal	Fuel Oil	Sand
Brass	Babbitt	Fluxes	Core Oil

We provide you with special envelopes to facilitate the mailing of samples to our nearest laboratory for testing. Reports are made to you by code, wire, telephone, or mail, as you wish. Hundreds of foundries rely upon this service.

This and a foundry engineering service backed by 38 years' experience in all types of foundry work is available. Why not drop us a line and learn how we may serve you?

Special Specifications and Control Methods Available

Chas. C. Kawin Company

Chemists—FOUNDRY ENGINEERS—*Metallurgists*

CHICAGO—431 So. Dearborn **BUFFALO—110 Pearl St.**

Adventures of Bill

(*Concluded from page 78*)

from a large ladle. The small ladle or crucible is reserved until the mold is almost filled. Then the metal from the small ladle is poured in to freshen up and raise the temperature of the metal which has flowed a long distance from the opposite gate. The runner is formed in the cope, about 2 feet in length, following the curve of the casting and terminating in a relief sprue or riser at each end. Six flat gates ¼ x 2 inches in the drag joint admit metal on one side, while two similar gates serve on the opposite side. Estimated weight of the casting is approximately 900 pounds. Three alternative types of gate may be used on the box casting: (a) A single sprue at one side extending to the bottom and connected to a runner in the form of a cross with a small upright gate at the end of each entering the mold cavity; (b) Two sprues at one side 3 feet apart, extending down almost the full depth of the casting. Metal from each sprue enters the mold through two narrow gates, one about 6 inches from the bottom and the other at the top of the mold. The top gates will supply fresh, hot metal to fill the top plate and cover the core; (c) An upright gate ¼ x 2 inches above the center of each of the four sides.

"These are connected by a pouring basin in the form of a cross on the top of the cope. The third or last method is the best of the group. It promotes directional solidification, prevents straining of the mold and fills the top of the mold with hot metal. Obviously certain precautions must be observed. The gates must be perpendicular so that the metal does not cut the sand on the side walls. A strong, permeable sand is necessary. The core should be filled with coke to provide ample and ready passageway for the extra volume of steam generated when the core is surrounded by four walls of molten metal and then covered with additional metal on the top. Estimated weight of the casting is 1700 pounds. In a green sand or skin-dried mold this casting will strain unless the sand is rammed firmly and unless the mold is made in a strong, rigid flask."

Purchases Firm

Milwaukee Chaplet & Mfg. Co., Milwaukee, has purchased the Standard Chaplet Mfg. Co., Rock Island, Ill., and all manufacturing facilities moved to the Milwaukee plant at 1023 South Fortieth street. P. F. Rice is president of the firm.

Heavy Duty Sanders

Stanley Electric Tool division, Stanley Works, New Britain, Conn., has developed two compact heavy duty electric sanders for sanding, grinding, buffing and surfacing of wood, metal and other materials. The tool as shown in the accompanying illustration has an alumi-

num housing with sealed-type ball bearings. Motor is universal type operating on direct or alternating current, and available for use on 115, 125, 150, 220, 230 or 250 volts. One sander using 7-inch diameter disk has a speed of 4200 revolutions per minute and weighs 17¼ pounds, and the other using a 9-inch disk has a speed of 3300 revolutions per minute and weighs 18 pounds.

Journal Bearings

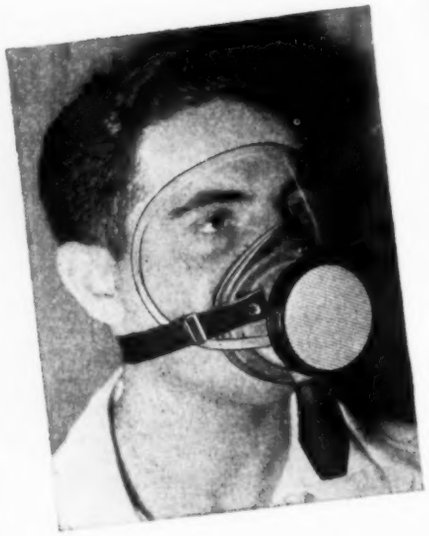
Jeffrey Mfg. Co., Columbus, O., just has made available a new and improved line of solid and split journal bearings as shown in the accompanying illustration. The bearings are said to be accurate in dimension with modern rounded lines, smooth gun metal finish, machined bases and faced ends. Height to center line of shaft is maintained

rigidly, and babbitted bores are broached to smooth, hard surfaces. Both styles are tapped for greases cups or pressure fittings. Ample storage groove in top provides proper distribution of lubricant. In addition split bearing has feeder grooves on each side.
Cutoto go

Whiting Corp., Harvey, Ill., has opened a new office at 6381 Hollywood boulevard, Los Angeles, to provide engineering and sales service for its aviation products. Evert C. Hokanson has been named manager of the office.

FACE SHIELDED RESPIRATORS

for Full Face and Lung Protection



Here is an excellent safeguard to protect your workmen against nuisance dusts, fumes, and flying particles.

- *Pulmosan face-shielded respirators are:*

NON IRRITATING FOGGING INFLAMMABLE

- *Circular by request.*

PULMOSAN SAFETY EQUIPMENT CORP.
176 JOHNSON STREET BROOKLYN, NEW YORK

CORE MIXTURES CONTROLLED

(*Continued from page* 61)

center regardless of the number of cycles.

In order to stop the practice of sending large cores through the oven the second time we experimented with faster drying binders. It was found that with a certain resin core, the largest cores were perfectly dried with one pass through the core oven at a baking temperature of 450 degrees and a 2 hours and 28-minute cycle. This lowered temperature prevented the smallest cores from over baking.

It was evident at the beginning of the resin core experiment that no single core mixture would do for all classes of work. Either the light wall castings would crack or the heavy walled castings would scab or cut. In this connection it might be of interest to mention one very serious difficulty that we were able to eliminate by use of our new high temperature sand dilatometer. Certain castings were being scrapped due to a scab at the location adjacent to the gate.

Different core mixtures were tried to overcome this difficulty. More silica flour and more bond were added without curing the trouble. In fact the core would crack the casting and yet the trouble persisted. After installing the dilatometer and at H. W. Dietert's suggestion it was found that the cores were too hard and that the expansion was so high that what we thought was a scab was in reality a buckle. The first metal through the gate against the core would cause the outer layer of the core to expand and buckle away. With this harder layer removed the relatively softer inner core would cut away and a typical scabbing action would take place during the pour-

Table III

Sand Specification for Ottawa Silica Sand

Sieve No.	Desired Percentage Retained on Screen	Minimum Percentage Limit on Screen	Maximum Percentage Limit on Screen
40	2.0	....	3.0
50	34.0	30.0	45.0
70	46.0	35.0	50.0
100	15.0	12.0	20.0
140	3.0	2.0	4.7
200	....	....	.7

The percentage remaining on screens may vary within the limits of the minimums and maximums values shown so long as the composite sand remains within range of AFA fineness No. 48 to 52 inclusive.

Eliminates HAND UNLOADING

Saves Money & Labor—

Thousands of Roura Automatic Dump Hoppers are in use in leading foundries and plants! For here's a hopper that speeds-up handling time on raw materials and finished products . . . permits one man to manage the complete distribution and unloading job in less time than it formerly took several. One-man operated, it fits any standard-type lift truck . . . dumps at floor level or can be raised to any position. It won't tip and automatically returns to loading position.

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giving details of your requirements—our engineers will reply with recommendations and costs.

ROURA IRON WORKS

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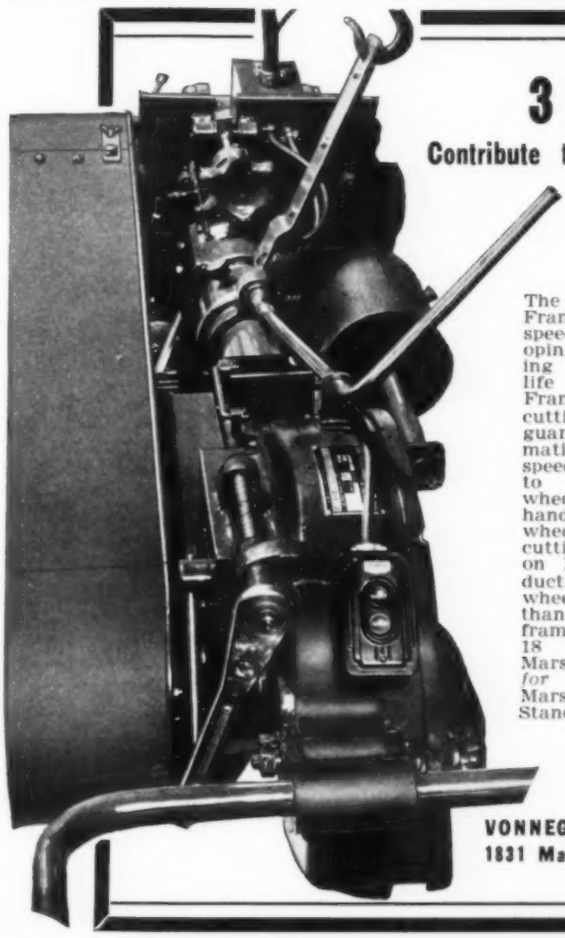

3 SPEEDS

Contribute to Marschke Swing Frame Grinder Efficiency

The Marschke A. C. Swing Frame Grinder shown here has speed control—3 *speeds*—developing correct s.f.p.m. during each third of wheel life • Marschke D. C. Swing Frame Grinders give *constant* cutting speed. Adjusting wheel guard to wheel wear automatically takes care of wheel speeds • Speed control, added to Marschke's vibrationless wheel rotation and easy handling, results in steady wheel contact and maximum cutting. Operators can rely on Marschkes for more production. You can expect less wheel and machine expense than with any other swing frame grinder. • Look into the 18 *features* accounting for Marschke superiority. *Write for full information* about Marschke Swing Frame, Floor Stand and Pedestal Grinders.

THE MARSCHKE LINE

VONNEGUT MOULDER CORPORATION

1831 Madison, Indianapolis, Indiana

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CHAPLETS
BENTONITE
BLACKINGS
FIRE BRICK
PLUMBAGOS
CORE PASTE
CORE WASHES
PASTE BINDERS
SPECIAL FACINGS
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CORE COMPOUNDS
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PARTING COMPOUNDS
NATURAL MOLDING SANDS

Shipped promptly from selected pits located in Illinois, Tennessee, Ohio, Indiana and New York.

FOUNDRY SUPPLIES AND EQUIPMENT FOR EVERY REQUIREMENT.

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Here's How . . .

TAMASTONE

INCREASED PRODUCTION 400%

● At left you see a TAMASTONE Match Plate made from 3 loose patterns. Note gates and risers for nickel alloy castings. No shrinkage expansion or buckling. Detail perfect—surface smooth as glass! The conversion of these loose patterns into a single match plate made it possible for the foundry to get uniform and proper gating — INCREASING PRODUCTION 400%!

● Whether it's large cope and drag patterns for use on roll-over machines or converting loose and metal gated patterns into match plates TAMASTONE will save you money! PROFITS WILL BE INCREASED 50% to 75%. With savings like these—you'll want to start using TAMASTONE at once!

TAMMS LIQUID PARTING

Keeps sand from sticking to patterns. Does not "build-up" on pattern—or interfere with perfect detail. To speed-up production, just spray on and dry with air hose! Many foundries get full day runs without re-coating.

TAMMS BLUE LAYOUT DOPE

Comes in convenient 8 oz., bench type, "brush-in" cans. It's liquid—ready for use! Dries quick—won't rub off! A scribe makes perfect line without chipping or cracking blue layout dope!

Get TAMMS BLUE CHALK to check casting leaks.

Write for TAMMS FOUNDRY SPECIALTIES Catalog

TAMMS SILICA CO., 228 N. LaSalle St., Chicago, Ill.

ing of the latter part of the metal entering the mold.

We standardized on three core mixtures for our entire range of work. No. 1 Core mixture for small diameter cores—thin sections is comprised of 1000 pounds washed and dried Ottawa silica A. F. A. 50; 10 pounds silica flour; 6 quarts cereal binder; 3 quarts bentonite; 16 quarts resin, and 4 quarts core oil. The core oil was retained in small cores to prevent over baking and prevent sticking in core boxes.

No. 2 Core mixture for cores having heavy wall thickness contains 1000 pounds washed and dried Ottawa silica A. F. A. 50; 50 pounds silica flour; 6 quarts cereal binder; 4 quarts bentonite; 16 quarts resin; 2 quarts fuel oil, and 4 quarts iron oxide.

No. 5 Core mixture for large diameter cores—thin wall is composed of 1000 pounds washed and dried silica A. F. A. 50; 25 pounds silica flour; 6 quarts cereal binder; 3 quarts bentonite; 20 quarts resin, and 2 quarts fuel oil.

Table IV

Obtains Increased Hot Strength

1% oxide	12 lbs.	15 lbs.	55 lbs.
2% oxide	20 lbs.	28 lbs.	120 lbs.
Silica flour...	15 lbs.	25 lbs.	75 lbs.
No oxide	3 lbs.	5 lbs.	20 lbs.

These cores gave the properties shown in Table I. The hot strength was measured on the 1½-inch x 2-inch specimen held at 2500 degrees Fahr. for 20 minutes. Baking cycle for the cores in Table I was 450 degrees Fahr. for a 2 hour and 28 minute cycle.

At H. W. Dietert's suggestion iron oxide was added to the No. 2 core to prevent burning in on the inside of the casting where sharp corners or abrupt changes occurred due to change in section or other causes. This caused a great improvement in cleaning cost.

The hot strengths were about right for the various core diameters and metal thicknesses so we adopted the practice of tagging the core mixture number into the core boxes so that the proper core sand would be rammed into the proper core box and also the casting would have the cast number of the core mixture on its inside surface. In this way we could work backward from the scrap heap in analyzing defects due to core failure.

Later experiments with the dilatometer developed the interesting fact that we could use a weak core suitable for our small work, say 3 to 5 pound hot strength and by the addition of iron oxide obtain

Tri-Ply
Foundry Riddle

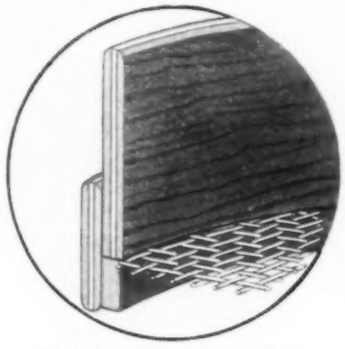
4 ways better!

1 **3-PLY FRAME**—An *exclusive* feature. Many times stronger than materials usually found in foundry riddles. One BIG reason why "Tri-Ply" riddles last longer.

2 **SPLIT-PROOF CONSTRUCTION**—3-ply frame material cannot split and "run" with the grain. Another reason why "Tri-Ply" riddles will give added months of useful service.

3 **NO CROSS WIRES**—Special construction, shown below, makes cross wires unnecessary. This feature adds materially to screen life through elimination of extra abrasion.

4 **LONGER LIFE**—They not only look better ("Tri-Ply" riddles are all mahogany stained), but they last longer because of many exclusive, patented construction features.



Made in all meshes and three sizes—16" 18" 20" diameter

Stocked by leading foundry supply houses

SEYMOUR & PECK CO.
P. O. Box 5609 Chicago, Illinois

Tri-Ply
FOUNDRY RIDDLES

COST NO MORE

hot strengths as desired up to 20 pounds.

We reduced the silica in our No. 5 core to 15 pounds and obtained a 3 to 5 pound hot strength. We added 1 per cent oxide to this same mixture and obtained 8 to 15 pounds hot strength. We added 2 per cent oxide which resulted in 23 to 50 pounds hot strength. This strength is sufficient to prevent cutting or washing on our largest work and gives a minimum of veining or penetration. One or two exceptional jobs having small core diameter and very heavy section require additional silica flour to prevent burning in.

Test results on core sand mixtures given in Table II are taken from regular 1000 pound batches. All batches have the same mixture containing 1000 pound washed and dried Ottawa silica sand of 48 to 52 A. F. A. grain; 15 pound silica flour; 4 quarts bentonite; 6 quarts cereal binder; 20 quarts resin; 2 quarts fuel oil and iron oxide (Fe_2O_3) as noted. Each test result is on a separate batch of core sand.

The idea of controlling core mixtures entirely by hot strength test seems to prove out in practice and the unexpected discovery that these hot strengths could be obtained solely by the addition of iron oxide was of great interest to us. Although 20 pounds hot strength at 2500 degrees seemed to be strong enough to make any casting that we would be called upon to make. We ran a series of tests carrying the oxide addition on up to higher percentages, and the data are presented in Table IV.

We have been cautioned that trouble might be encountered if we used oxide containing calcium or like impurities. For this reason we are careful not to change our source of supply. Also we are checking into the possibility of obtaining this oxide from the same mine so as to cut down the chance of variable still further. The author wishes to express his appreciation to Mr. Robert Jakoby metallurgical department, Key Co., for the photographs.

Publishes Standard

The "Standard for Grinding, Buffing and Polishing Equipment Sanitation"—Z43—1941 originating in the American Foundrymen's Association has been approved by the American Standards Association as an American standard. Copies are available through the association, 29 West Thirty-ninth street, New York, at 60 cents each.

Reading Foundry & Supply Co., Reading, Pa., recently was damaged to the extent of $10,000.

STEP UP PRODUCTION!

■
MODERNIZE

Many plants grow like Topsy and will continue to do so unless new problems are approached in a different manner. With the best of intentions, the plant management, equipment salesmen, local contractors, your best friends, and members of your organization may not possess the training and experience needed to ferret out and study important factors which must not be overlooked in surveying your present and future requirements.

■
YOUR FOUNDRY

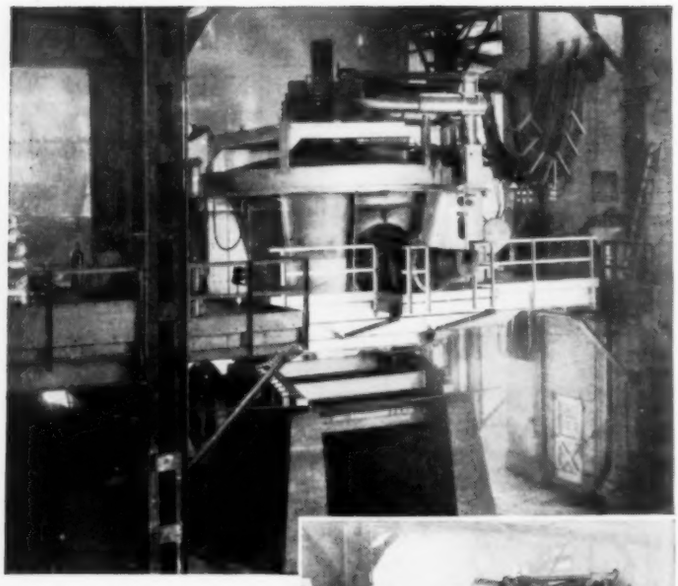
New improvements must follow the lines of modern technical development in order to attain desired objectives. Whether you find it advisable to boost production, improve the product, cut production cost and provide better working conditions for the men, the old saying that "if it is worth doing, it is worth doing well" simply means that, within practical and economical limits, power-driven machinery must be given first consideration.

■
NOW

Our services and the experience gained during twenty years of uninterrupted practice as foundry engineers are at your disposal in planning new projects, building expansion, plant modernization and in carrying same through to a successful conclusion. Clients of national prominence will attest to our ability. A. A. Wickland & Co., Foundry Engineers, Engineering Building, Chicago.

A. A. Wickland

—Advt.



Illustrated is a recent installation of a 25-ton Heroult Furnace with many special features. It is an all-welded unit equipped with 18-inch electrodes. The platform is attached to the shell — tilts when pouring. The shell is flared from floor level to roof — materially increasing scrap capacity.

Heroult
ELECTRIC FURNACES

AMERICAN BRIDGE Heroult Electric Furnaces now embody novel and distinctive features—the result of constant striving to perfect the most modern and economical tool for efficient melting and refining of iron and steel for castings, high grade alloy, tool and stainless steels.

Dependent on size and operating requirements they are adaptable to hand, chute, machine or drop-bottom bucket charging. Capacity ratings range from ½ to 100 tons.

Why not avail yourself of the specialized experience of our furnace engineers for your specific requirements.

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United States Steel Export Company, New York

UNITED STATES STEEL

American Aluminum Taper Strip Flasks have these six outstanding features which have been proved by hundreds of critical users to be definite keys to more profitable molding:

1. Riveted Square Corner Construction—the same principle used in building skyscrapers—provides everlasting strength and long life. **Steel wearing strips** protect broad top and bottom flanges.

2. Walls are Heavily Ribbed to prevent distortion from power jolting, squeezing and vigorous hand ramming.

3. 5° **Inside Taper,** for speed and ease in stripping, means maximum production of good molds. The entire flask lifts off the mold—there are no hinges or corner latches—nothing to strain, twist or loosen.

4. Interchangeable Pin System. A patented pin pad permits the use of any standard pin without the expense and bother of changing match plates and molding machines.

5. Easy-acting, Rustless, Non-binding Sand Strips support the cope sand on all four sides. They consist of two cadmium plated "L" shaped sections (instead of four) which flip in and out by the simple movement of two improved "T" type pull-out levers which cannot be clogged with sand. A simple ball latch locks the pull-out lever both "in" and "out" so it cannot be jolted out of position.

6. Inside walls are precision machined to permit more perfect lifts.

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505 S. BYRKIT ST. MISHAWAKA, IND.

ESTABLISHED 1788

THE E. & G. BROOKE IRON COMPANY

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Manufacturers of

Basic, Malleable, Foundry, Forge and Low Phosphorus Pig Iron

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BIRDSBORO, PENNSYLVANIA

TEETH TO CHEW LIMESTONE for national defense

These tough, little castings are called "dragpebs." They line the inside of a cement-making machine, which is simply a large drum filled with limestone and steel balls. The drum revolves. Steel balls, limestone and "dragpebs" all start chewing at each other —with the result that the limestone comes out in powdered form ready to be made into cement.

Today, cement is a vital material in our national preparations for defense. High-speed heavy-duty military highways . . . ponderous bridge abutments . . . factory foundations . . . airfield runways—cement is needed urgently for all of them.

The use of Mayari in "dragpebs" is but one of many ways in which Bethlehem's unique alloy iron has been called upon to serve in the defense program. F. L. Smidth Company, of Elizabeth N. J., who make "dragpebs," are strong for Mayari. It produces sound, strong, tough castings and keeps rejects at a minimum.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

WINTER DELIVERIES!

Photo—H. Armstrong Roberts

BECAUSE WE MINED...

AND STORED...

OLD MAN WINTER is the only priority administrator on Federal Green Bond! From fall to spring, he holds the reins in Wyoming. Since bentonite is surface-mined and since Wyoming winters dip to 40° below zero—it is obviously not practical to mine in winter.

Users of Federal Green Bond, however, rightly expect to enjoy the economies of "the ideal sand bond" the year round! Evidence that they *will* is the illustration (lower left) showing the largest stock piles of bentonite in the world!

More foundries used more Green Bond this summer than ever before, which necessitated 16-hour-a-day mining operations most of the summer in order to accumulate those tremendous stock piles.

The universal acceptance of Federal Green Bond is the best advertisement we have to offer. We gladly meet the challenge of our growing defense demands.

Whether or not you now use Federal Green Bond, remember these two facts:

1. You can always get Green Bond *when* you want it.
2. You can't buy a better bond than Federal Green Bond!

Federal Green Bond

The FEDERAL FOUNDRY SUPPLY COMPANY

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CHICAGO · Seacoal Plant CHARLEROI, PA. · CHATTANOOGA, TENN. · DETROIT · MILWAUKEE · MINNEAPOLIS · NEW YORK · ST. LOUIS · RICHMOND, VA. · Mines UPTON, WYO.